Architectural
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THE ARCHITECTURAL FORUM

AUGUST 1921

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THE EDITOR'S FORUM

WASTE IN THE BUILDING INDUSTRY

WE find ourselves being gradually reconciled to the fact that we are in the midst of a process of readjustment and reconstruction from an economic viewpoint that is going to tax our energies in ways far different from those resulting from any experience in the last quarter-century.

Coincident with each important war in modern history there has been a period of great inflation, and following it a long era of readjustment and falling prices. One peculiarity of these periods is that wages in actual dollars have not receded as much as prices of commodities. Inasmuch as there is always an economic balance maintained between wage rates and the costs of commodities there is a reason for this apparent discrepancy.

The explanation may be found in the revolutionary changes that took place in industry during these previous periods of reconstruction. The most recent analogous situation is the period following the civil war and it is well known that the very wide introduction of machinery then was sufficient to increase production so that for a higher weekly wage a much larger volume of work was possible than for the previous wage. The workers were able to produce more and there was not the necessity for a decline in wages to correspond with the reductions in commodity prices. This permitted a higher standard of living among laboring people and this standard has steadily risen. Whether present wages are greatly reduced in the coming years will depend upon the productivity of labor. Machinery has seen a marvelous development but it is hardly probable that it can be sufficiently further developed to provide the whole answer. The larger help must come from elimination of waste and from better management.

Considerable thought is being given these problems and the building industry stands out conspicuously as being in need of special study in this regard. There are certain conditions in the building industry which cause large wastes, such as seasonal employment that perhaps cannot be materially changed by the efforts of architects, but in certain other kinds of waste and in management there are many opportunities for the architect to aid.

Mr. D. Knickerbacker Boyd, in an address before the Engineers' Club of Philadelphia, brought out many points of vital importance in the consideration of co-ordination among the elements of the industry that would reduce the amount of seasonal unemployment. He likewise touched upon other details of direct concern to architects. He claims that much waste could be eliminated if architects and engineers were to standardize the parts of certain buildings and the detail drawings for the erection of the buildings. It has been estimated that the architect devotes 25 per cent of his time to the designing of a building and 75 per cent to structural and mechanical requirements. Standardizaton can certainly be applied with promise of saving to this 75 per cent. Likewise, in the matter of contractors' bids and the great waste involved through duplication, the architect can materially serve in working out some method of quantity surveying which will greatly lessen the contractors' overhead costs; otherwise some system of charging for estimating time would seem to be necessary.

The whole subject is worthy of very serious study on the part of the profession, and while the part the individual can play may seem small in comparison with the task, the aggregate effect will count and another step will have been taken toward stabilization.

SMALL GARDEN DESIGN

ANY movement which will encourage the development of garden space about the typical suburban home is to be commended. The Society of Little Gardens has this object as its aim and it now appeals to the architectural profession for assistance in securing garden designs that may be carried out by people of moderate means. The Society has arranged a competition with prizes as described elsewhere in this issue, and the resulting advocated designs are to be made available to people interested in developing their property in a modest way.

BOOK NOTES

A BOOK OF CEILINGS, by George Richardson, F.S.A. Reprint by William Hepburn, Inc., New York. 48 plates, 11½ x 17½ ins. Board covers. $12.50 net.

THE original book, of which this is a recent reprint, was published in London in 1774. It is a collection of plates with brief descriptions, showing line drawings of the patterns which were executed either in modeled plaster or in painting. The prevailing interest today in the styles developed in America and in England during the eighteenth century lends interest and value to this collection of drawings. The original plates were etched by George Richardson who was a designer of the period, and who, we note from his introduction, was identified with the Adam brothers for 18 years.

The designs cover a variety of treatments, all based on varying compositions of geometrical nature; some are for flat ceilings and others for different vaulted types. The reproductions of the plates are in good, clear lines and the size of each ceiling is given to indicate the scale. No idea of the relief of the ornament is given because there are no sections, but in other respects the book provides a valuable reference work on the subject.

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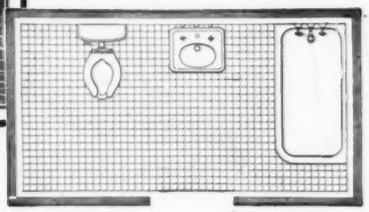

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The
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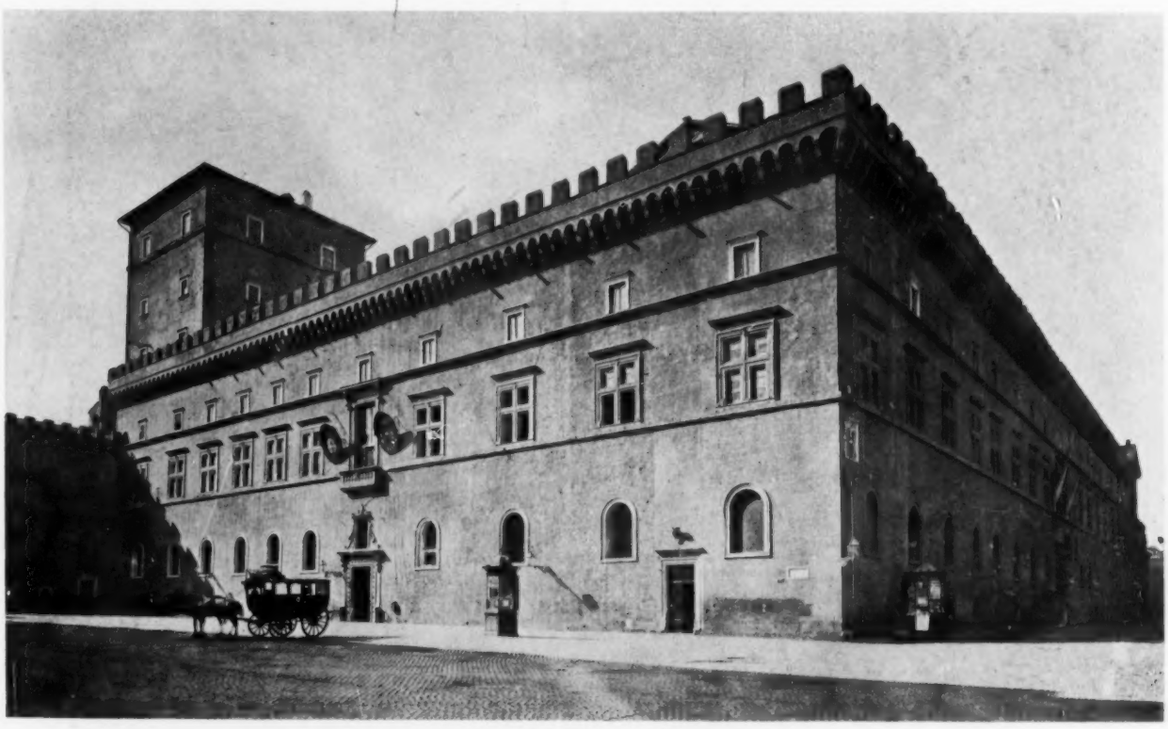
VOLUME XXXV AUGUST 1921 NUMBER 2

The Restoration of the Palace of Venice in Rome

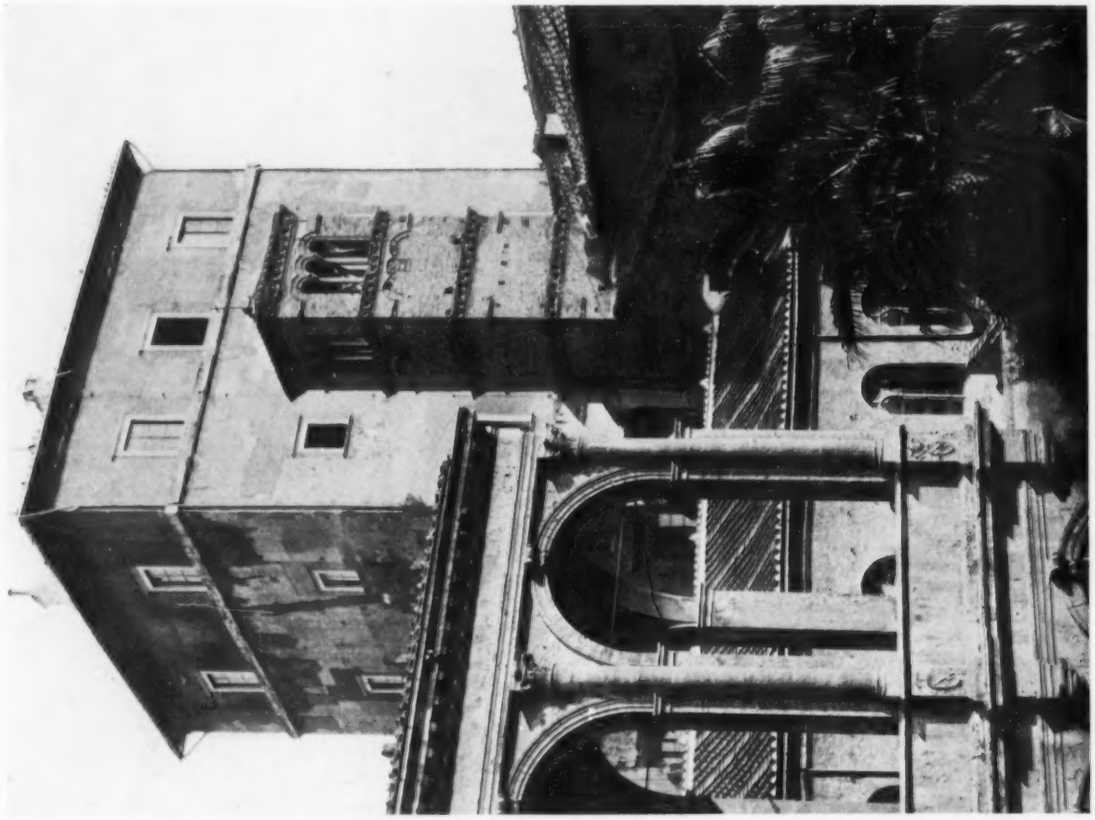
By UMBERTO OLIVIERI

IN August, 1916 the Italian government, yielding to the general pressure of public opinion and in order to secure immediate partial compensation for the serious losses caused by the Austrians to national art treasures, such as the destruction of the fresco by Tiepolo on the vault of the Church of the Scalzi, decided to seize the Palace of St. Mark in Rome, commonly known as the Palace of Venice, or the Palazzo di Venezia, which had been since the Peace of Campoformio in 1797 in the possession of the Austro-Hungarian government, as the seat of the Austrian embassy to the Vatican. After having added this magnificent monument to the patrimony of the state, the government devoted it to a collection of works of art, and in order that it might perpetuate the name which suggests its origin and history, called it the Museum of the Palace of Venice. Thus this ancient and dignified building of the popes, which was later the sumptuous seat of the ambassador of the Venetian Republic, afterward of the Austrian representative, and since 1870 the symbol of the irredentistic aspirations of Italian youth, has now become for new Italy the symbol both of her victory and of the spiritual needs of the nation.

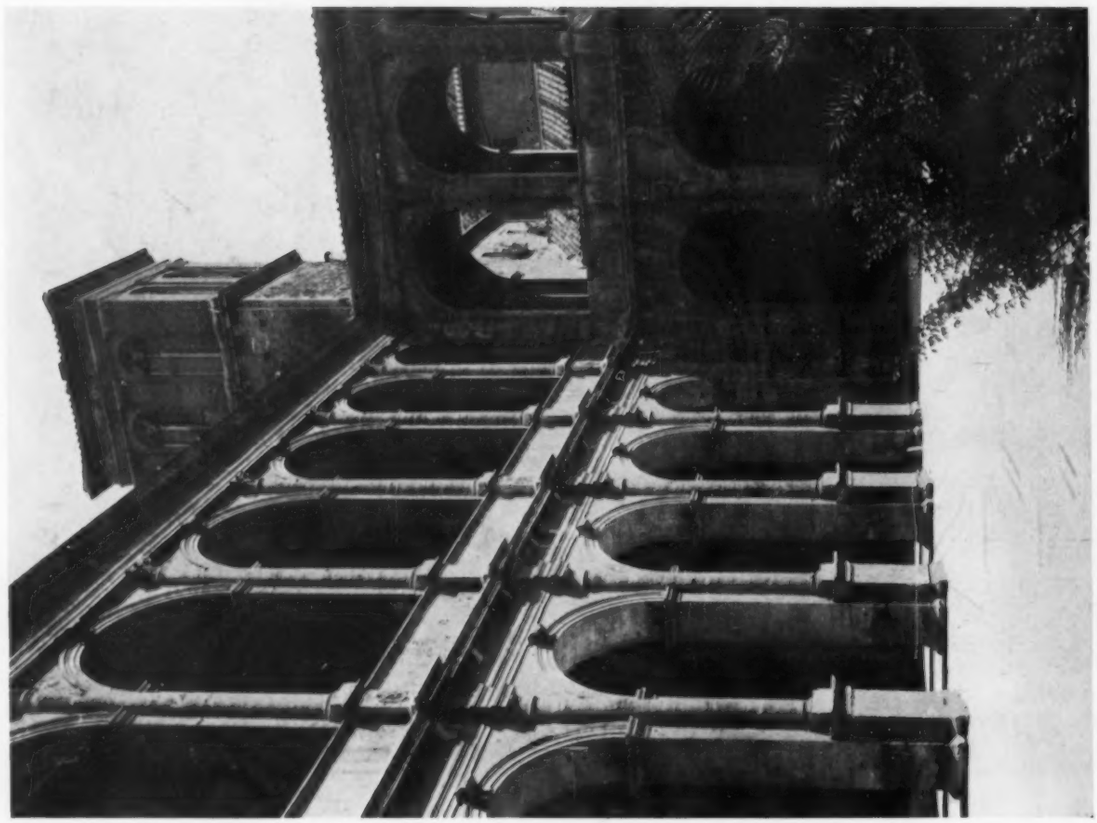
In order to understand its importance and how it came to be so coveted, it is necessary to review briefly the history of the edifice. Its dedicatory inscription by the Venetian cardinal, Pietro Barbo, establishes the year 1455 as the date of the construction of the eastern wing of the palace proper. The nucleus of the present palace, however, is the



The Palace of Venice, Rome



XII CENTURY BELL TOWER SEEN FROM COURTYARD



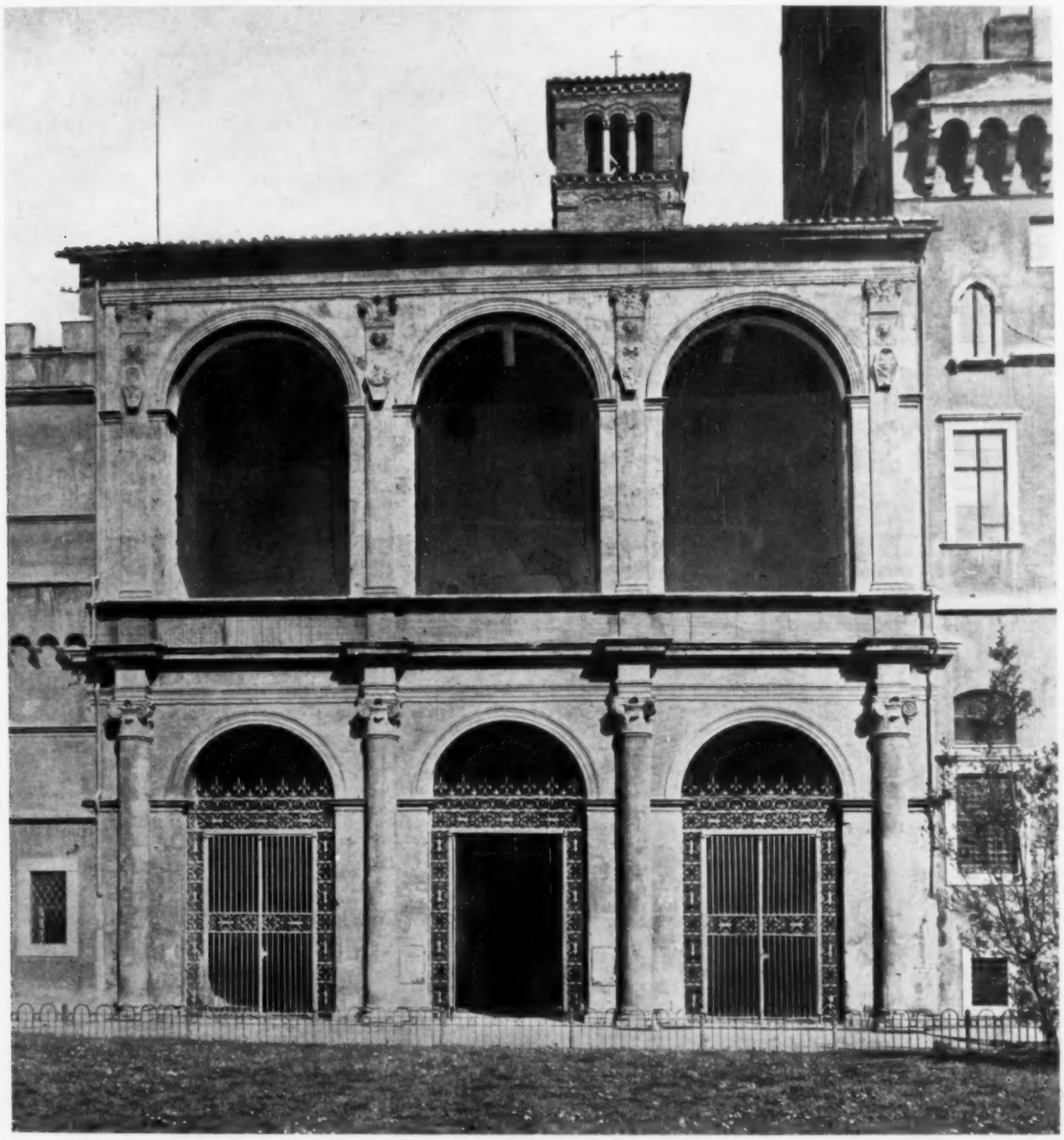
DETAIL OF COURTYARD LOGGIA

THE PALACE OF VENICE, ROME

ancient and glorious Basilica of St. Mark, still an important part of it, dedicated by the Venetians to the two saints, St. Mark the Evangelist, patron saint of the Adriatic, and the Pope St. Mark, and consecrated originally by the latter to the veneration of St. Mark the Evangelist in 366.

In the year 833, by order of Gregory IV, the basilica underwent a radical restoration; nearly at the same time as the construction of the palace, the church was transformed by Cardinal Pietro Barbo into the form which it still retains. To the fact of the pre-existence of the church and its dedication to saints so endeared to the Venetians, we owe it also that Barbo, learned and magnificent cardinal, chose this location for his luxurious abode. The church was by degrees wholly surrounded by the palace, and extends through it from the atrium, which opens onto the little Square of St. Mark, to the sacristy on the street called of the Plebiscito.

The first fruit of its recovered possession by Italy has been the recent architectural improvement of the church. The fine Loggia della Benedizione (or Benediction), placed just above the atrium or entrance of the church, lost long ago through the bad taste of a Venetian ambassador, has been restored and, as shown in one of these illustrations, the harmony of its three arches of the fifteenth century, which the ambassador walled up, is once more to



Facade of the Church of St. Mark, Part of the Palace of Venice
After the Walls Closing the Arches of the Loggia Had Been Removed

be seen. Today, by the intelligent direction of the Royal Superintendent of the Monuments of Rome, the loggia, as restored to its primitive splendor by the removal of the walls in the arches, is a proof of the artistic aspirations of our epoch, which, if it does not know how to create, at least intends to restore throughout Italy, to their original beauty, all the remains of the past centuries.

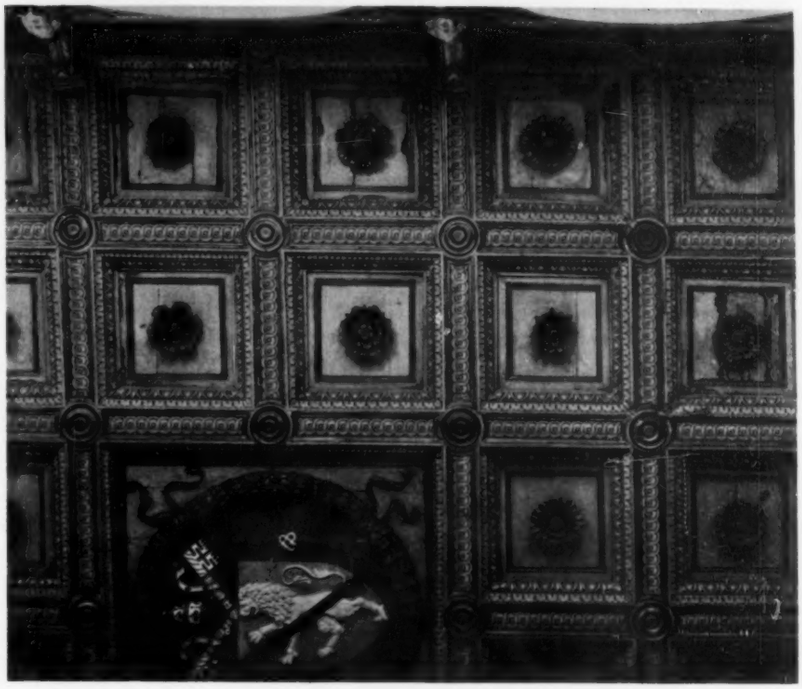
The little Gothic window which opens toward the Piazza San Marco, is a relic of the first enlargement made for the house of Cardinal Barbo, who meant to build his residence in the Gothic style throughout. Being a true man of the renaissance, the Venetian, Pietro Barbo, who afterwards became Pope Paul II, had the constant ambition, like that of a Roman emperor, of transmitting his likeness to posterity. Therefore at the head of the original staircase, which has been replaced during this last year by another more spacious and easier, was placed the bust of the pontiff, which has lately been brought back to the palace, after passing a few years in exile at the seat of the Spanish embassy in Rome. The ancient staircase on the side toward the Piazza Venezia has been left as it was. Narrow, not well lighted, severe in its sober architectural decoration, it proves by its original details the very primitive character of the building, still mediæval enough to look like a fortress with its towers and battlements, while the mass, strong and flat, already reveals the characteristics of the renaissance. It can properly be numbered among the lordly Roman palaces of the fifteenth century, with the grace of its magnificent *loggiato*, the enchantment of the *palazzetto* (or "little palace," called also St. Mark's Garden), its Gothic windows, and its spacious rooms, embellished with decorations which express the new born love for the art of Imperial Rome.

Who was the architect of the palace? At least to whom may we give the credit, among the bearers of the great names of Italian art, of even having co-operated in giving to this papal building a form of purest beauty? Vasari, about 1500, attributed the design to Giuliano da Majano, but his opinion is flatly disputed by architects and art lovers, inasmuch as Giuliano was only in Rome after 1465, when the building, which is the Roman equivalent of the Pitti Palace in Florence, was already under way. A biographer of Paul, Gaspare da Verona. extols the cleverness of a certain Francesco of Borgo San Sepolcro, as architect and director of the construction in the first years of this pontificate. Guiseppe Zippel, however, in his work on the Palazzo di Venezia, thinks that Francesco dal Borgo was not the author, but only one of many artists who quietly worked with others on this and other works to prepare the glorious splendor of Italian architecture. Many architects, artists and authors, such as Guiseppe Sacconi, Ettore Bernich, Domenico Gnoli, Guiseppe Zippel and Corrado Ricci, have thought that the conception of both palace and garden is due to Leon Battista Alberti. Zippel says: "The one who ruled undisputed lord in architecture in the Rome of Eugene IV and Nicholas V, was Alberti. In those very years when Pietro Barbo was thinking of the reconstruction of the district of St. Mark, this very learned Florentine composed and published that wonderful book 'De Arte Ædificatoria' (The Art of Construction), which was the first book on architecture written at the time, and formed a code for architects. Can we not believe that the Venetian Cardinal Barbo, cherished by Pope Nicholas, with whom he had in common both love for art and enthusiasm for great building plans, would naturally rely upon the learning and ability of this prince of architects, then in Rome? This is probable, inasmuch as Nicholas V himself derived the inspiration for the superb transformation of St. Peter's, the Vatican, and the Leonine City, from Alberti's doctrine. It is very likely, we

Secondary Entrance to Palace of Venice

think, that to Alberti is due a great part in the promotion and fostering of the building ambitions of Cardinal Barbo, as well as the realization."

Corrado Ricci, surely a great authority, says: "Both the architectural ensemble of the palace, St. Mark's porch, and some detached parts, as well as the conception of the garden, and several motives of decoration, in a word the whole building, regarded either as a mass or in its details, reveals in the one who first planned it, the innovator, the man who had conceived an original idea, after long studies, not only artistic, but also historic and literary; the humanist who had penetrated not only the forms of antiquity but also the spirit." And such a man in that day and place, could be none other than Leon Battista Alberti. That the search for his name in documents of that time might be fruitless, is easily understood; Alberti, and this is more than proved, did not always attend to the execution of the works for which he gave advice or drawings. He himself declared: "It is enough to give the right advice and drawing to whomsoever asks it of you." Alberti, as also Raphael later on, in things relating to architecture, was an artistic adviser of so much authority that to him there went for counsel or plan, popes and princes from all parts of Italy. The Venetian, Pietro Barbo, cardinal and then pope, his nephew, Cardinal Marco Barbo, Cardinal Domenico Grimani and many other prelates and pontiffs of the fifteenth century, especially Innocent VIII, took all possible pains to make splendid the building which gradually surrounded the ancient Church of St. Mark, taking the place of the very squalid houses then existing.



Detail of Ceiling in Church of St. Mark

Those in charge of the Palazzo di Venezia since its acquisition by the Italian government have done much to restore the interior to its original condition. The Sala Regia, which had been partitioned off into six rooms, is now its original size and here were found the original decorations, work of the end of the fifteenth century and attributed to Bramante. A long line of pilasters, decorations with candelabra-like ornament and set between panels of imitation marble, is painted on the walls and upholds a rich entablature of which the frieze contains winged figures of Fame, with trumpets. On the lower part shields are applied whereon are painted portraits of the Cæsars. The complete restoration of the Sala Regia and the Sala del Mappamondo, or Room of the Globe, to their original appearance and the renewal of the remains of the decoration in other of the state apartments are the heavy tasks confronting those in charge of the restorations. The problem deals chiefly with motives purely ornamental, and for that reason very well understood, while the few figures comprised therein are preserved nearly in their integrity. So, while it is planned to restore a genuine work of the fifteenth century and to discard the paintings of later restorations, the work will be executed with reverence for the memory of the famous painters to whom are due the original decorations.

Such a building, closely connected with Italy's art and history, could be properly used only for the purpose which has been determined by the government decree. A great museum of the arts in general, which is not merely a gallery for pictures or a fine collection of statues, has been lacking in Rome up to the present time. A comprehensive, permanent collection of furniture, glass, wood carving, arms, tapestry, ceramics, stuffs, and medals has never been assembled, nor is it possible to assemble it in any of the present Roman galleries. When in 1911 the successful exhibition of retrospective art was held in the Castle of St. Angelo in Rome, many Italians asked why it would not be possible to establish in Rome a permanent collection which would exhibit examples of the arts connected with every phase of human life, placing, for instance, a wrought iron bed or carved table alongside majolica plates, and near the work of some famous painter

of the epoch, who, in common with the humble smith or the poor potter, enjoyed the artistic influences of that day.

In many other countries, especially in Germany and Switzerland, the perfect arrangement of such a museum does not make evident the really small amount of artistic material displayed therein. With the Italians, on the contrary, the extraordinary abundance of masterpieces in museums and private collections has resulted in a special point of view regarding certain arts, so that finally they have been called, unjustly, "minor arts." This has been encouraged by pseudo esthetics of a literary nature and by the survival of fixed ideas of art which arose at the beginning of the nineteenth century, during the neo-classic vogue. For this reason many of the best products, in which the immortal art tradition of the people of different Italian regions is expressed, are unfortunately lost to Italy through commercial dealers, often of little intelligence and less conscience. The exhibition in the Castle of St. Angelo gave to all lovers of art a broader vision of the possibilities of artistic education, but Italy was too soon upset by the war to accomplish anything in this field.

Now the acquisition of the Palazzo di Venezia has given a new impetus to this idea. The largest rooms of the pontifical apartments, renewed as to their fifteenth century decorations, will provide in the Italian capital a marvelous suite for official receptions, especially on the occasion of the visits to Rome of illustrious personages or the heads of states, and also might serve as the anterooms of the greater museum which might arise from the broad organization of which we have spoken. A few undoubtedly genuine pieces of rare beauty, proper proportions and correct dates will complete the furnishing of these great halls, part of the interest and attraction of which lie in their enormous sizes, unusual in modern edifices. Then will follow the sections of the museum proper, where paintings and sculptures of the renaissance will not be stored in cold rooms with iron bars at the windows, but will be placed just as they might have been in the house of one of the most magnificent patrons of the golden age, assembled with furniture and other precious things, all bearing the character of a taste educated to the worship of beauty.

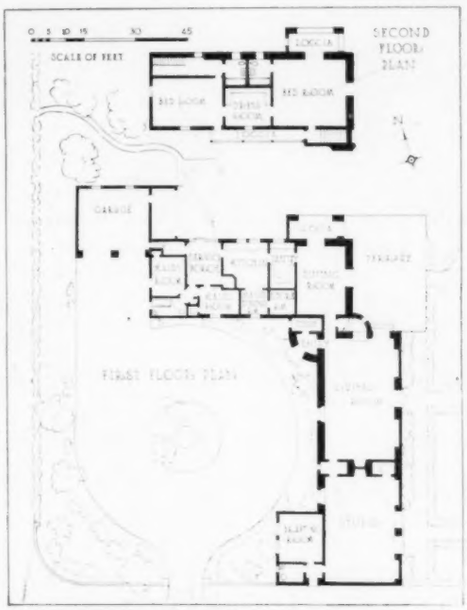
What has been done so far in the Palazzo di Venezia gives, as we have said, great hope in one direction, but great fear in another. No fewer than six offices of state departments have been located in the old building of Pope Barbo, and those who know the inherent obstinacy of bureaucracy might fear that the cause of the museum is lost forever. Further danger of similar occupation was narrowly avoided; one ex-president of the ministry thought of making the palace a seat for a military club, with kitchens and all other appurtenances, while another wanted to arrange it for government archives or other purposes. But notwithstanding these and other similar attempts to spoil the beauty of the palace, there is still ample room left to begin with, and to prevent further encroachment there is the great enthusiasm and invincible determination of the director, Professor Hermanin. So, if faith and enthusiasm must necessarily look largely to the future, there is already such a good beginning made that hopes for final success have a secure foundation.

Elevation of Wall, Hall of the Mappamondo, Palace of Venice
Showing Montegna's Detail

Some Work of George Washington Smith

By WILLIAM WINTHROP KENT

IT has often been said that the most successful architecture in any country is that which is worked out in what was the original architectural type of that region. The early settlers of what is now the state of California, being Spanish, constructed their buildings in the Spanish style, slightly influenced in some few cases by Italian details, and by a happy circumstance this was exactly the architectural type best suited to the climatic conditions of the state. The early builders, therefore, set an example in the way of type, and the direct simplicity of their structures, which still exist after several centuries, points out the way to successful designing for architects who have come later. Many architects in California are today designing along the lines of Spanish or mediæval Italian architecture; many also trying to keep to simplicity in plan, elevation and detail whether in a purely Spanish, Italian renaissance or other vein. Of all these there are a few whose buildings are beautiful and successfully meet the exacting local conditions of climate, scenery, materials and labor, and among these men may be properly included George Washington Smith, of Santa Barbara.



Floor Plans of Casa del Greco

It is easy to pursue too far any good style or character in design, especially when the designer feels, as many a Californian architect does, that he is traveling toward reform, if not actually on the path itself. The often subconscious impulse of the enthusiast is to go the limit or beyond, on the false theory that, if certain characteristics are good, their uttermost development must be better, and some Californian houses show the effect of this view. To expose the fallacy of such reasoning it is only necessary to remember that simplicity, for instance, which if properly followed is admirable repression, becomes, when unduly exploited, uninteresting crudity. Without emphasis of some sort a building cannot interest the eye. Remove too many mouldings and shadow-

Casa del Greco, House of George Washington Smith, Montecito, Calif.

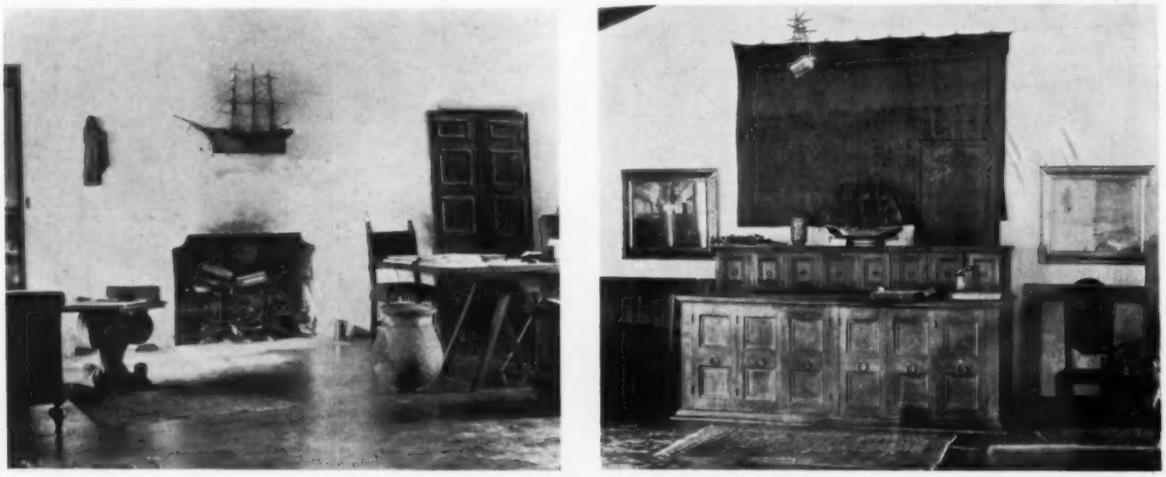
Two Views of Living Room in Casa del Greco

making projections and perforations from any construction, and the emphasis is lost. Mr. Smith has not made this mistake; although he is evidently a strong believer in getting back to certain first principles in house design, he is content with securing the characteristics of simple early Spanish or Italian architecture, and stops there, because he knows that these characteristics are all that are needed in the work he is doing.

By no means, however, is his work mere reproduction or adaptation of existing architecture in Spain or Italy, or in books and photographs thereof, but, starting with the usual inescapable given conditions, he merely works in this vein, because he believes that it brings the best results, and these results are, in toto, distinctly original. Like many another, he has looked ahead and seen that the average dwelling of the future must, from economic necessity, be kept free from all superfluity of plan, elevation and detail without, however, losing its interest for the owner and the society in which he moves. This is a progressive and wise view for, when our present economic upheaval has settled down, living conditions will make all illogical and overdone architecture more than ever ridiculous and impossible.

Let us see what we gain by building a country house in, say, twelfth century Castilian Spanish: First, the meeting of an owner's requirements by simplicity of plan; second, the logical use of available, substantial materials, such as stone or brick, or concrete, terra cotta and plain wood; third, simplicity in detail; fourth, the full utilization of the value of broad wall surfaces by careful study of openings; fifth, by cement stucco and hand finish, the harmonization of exterior with foliage, flowers and scenery in general, and of the interior with either richly carved or very plainly designed furniture. Briefly, all the design becomes a beautiful foil for some things or an appropriate accompaniment of others, and the chances are that with the growth of taste, both these qualities of contrast and harmony will be more and more appreciated by the general public.

It is always difficult to analyze design, to find wherein lies the charm of a good house, and harder

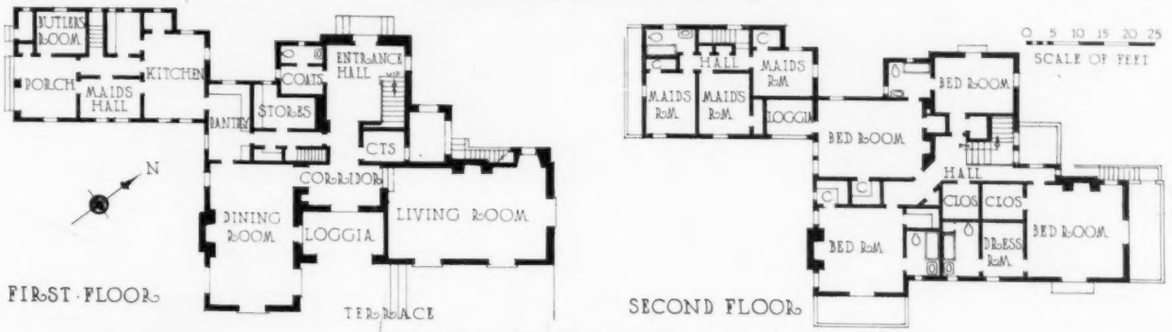


Two Views of Studio in Casa del Greco

still to indicate wherein an architect has done original work and has shown his individuality. The adaptation, however, of beautiful ancient forms to modern uses often tells this, and in the use of perforated ornament, suggested by the rustic patterns of open brickwork for small windows, intended only for ventilation or similar practical purposes, Mr. Smith has shown commendable taste and considerable originality. In the utilization of the thick walls for cupboard and bookcase recesses, one sees quickly that he has not only realized

Detail of House of Mrs. De Witt Parshall

the practical use, but appreciated the beautiful effect of such recesses by his emphatic and correct location of them. To find equally instructive examples on the exterior, it is necessary to note the butting of a lean-to roof against the higher plain wall of a main building, as in the Lindley house. Again in the Lindley residence the effect of weight as well as strength and security against too great a drip from the eaves has been secured by a bracket-like projection of the wall along the entire eaves. It is a question, however, whether

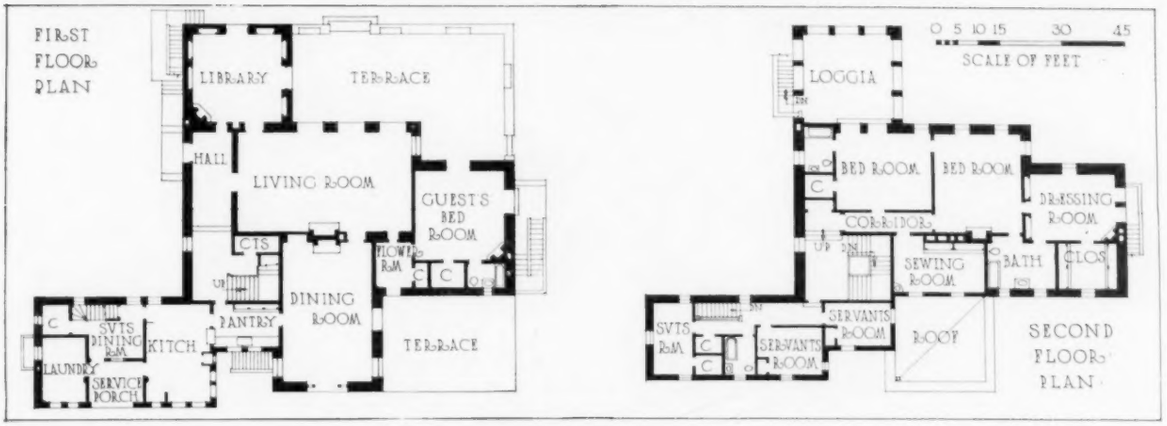


Floor Plans of House of Mrs. De Witt Parshall

Details of Entrance Front, House of Mrs. De Witt Parshall, Montecito, Calif.

HOUSE OF MRS. WILLARD P. LINDLEY, SANTA BARBARA, CALIF.

GEORGE WASHINGTON SMITH, ARCHITECT



Floor Plans of House of Mrs. Willard P. Lindley, Santa Barbara, Calif.

this detail does not involve the loss of much of the beautiful eaves-shadow, given by a greater projection of the tiles from a perpendicular wall. It is, however, in his unlabored designing of gently sloping tile roofs at different but logical heights, that he has secured some of his best effects in perspective. Anyone can cover simple walls with shed-like roofs, but to place those roofs so as to obtain picturesque and harmonious composition requires no small architectural ability. Sparingly has the curved line been used in Mr. Smith's work, either on plan or elevation, although on elevations, when the round or segmental arch is introduced, it is made effective by contrast with the lintel-supported openings of most of the windows; generally, however, the straight line and the rectangle are the controlling factors throughout.

The use of exterior staircases, for access to second story loggias and rooms, is made to contribute materially to the beauty of the exteriors by their carefully planned locations and treatment; the use of plain bracket forms to support landings is an aid in escaping the commonplace, and on the Lindley house a very broad and substantial air is secured at grade by continuing the terrace higher as a landing platform for the staircase. This landing turns the corner and reaches the lower terrace levels by a few more steps at front and back. If one might suggest any improvement in detail, which is not an essential factor in most of such work, it would be that the chimney pots offer a tempting chance to design more varied forms such as one sees a hint of at Capistrano, or might find in far-away Spanish Berlanga, Soria or somewhere in the wild province

Drawing Room Fireplace in Lindley House

House with Attractive Stucco Texture, at Santa Barbara, Calif.

of El Vierzo; but then again, one might not. However, Ruskin to the contrary notwithstanding, I believe in making a chimney pot as interesting as possible.

Also, it is well known that in metal working the Spaniards were from early days most famous, and in fertility of invention and beauty of execution not excelled, and possibly not equaled, by the Italians. Taking a hint from this, and from beautiful, but not intricate examples of balcony rails and window grilles, would it not be worth while to avoid the extreme simplicity of the usual plain iron bars, and design more decorative rails and window grilles, which could be made by local blacksmiths? Nothing of equally inexpensive character is of richer effect than that of well designed wrought iron against sunlit white walls, and a richer rural character might be preserved by its adoption, even in its less elaborate forms.

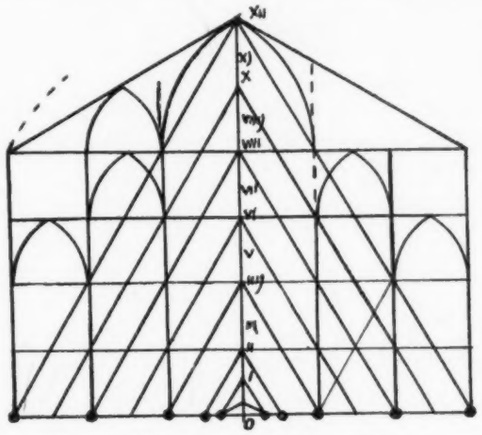
Eastern architects, who really appreciate the great beauty of much of the modern Californian architecture, are also apt to say, "Yes, it's charming, but we cannot do work like that in our climate." True, in one sense, but in another we can learn much from a study of its best characteristics and improve immensely on present work, by grasping why and how the best architecture of the Pacific coast is produced, for aside from the difference in climate, we can secure equally good results elsewhere, if sufficient effort be given to the work.

Gateway, Estate of Mrs. Mary E. Stewart, Santa Barbara, Calif.

Proportion in Architecture

By WOLDEMAR H. RITTER

EVERY architect and every intelligent critic of architecture will admit that a knowledge of proportion is fundamental for all good architectural composition. They will go further and grant that good proportion constitutes good architecture; that without it a building, no matter how convenient, how skillfully constructed, how well ornamented, is not architectural and that such designing is not a fine art. But when the architect or critic of architecture attempts an analysis of this fundamental element, proportion in architecture, the logic he used in defining the art deserts him, and he resorts to vague generalities. The architect, getting down to his problem of design in a given building, solving the utilitarian side of the project, gropes about like a blind man or strikes off a sketch as a gambler would flip a coin, to see if he can hit upon something. When he finally arrives at a satisfactory composition the route he has traveled has been long and tedious and the traits of character that have won the day are more likely to be perseverance and skill in elimination than that rare quality supposedly at the base of all good design, an intuitive sense of proportion.



Facsimile of Section through Milan Cathedral. Drawn before Construction in 1391 by Stornalocho

It never seems to occur to most architects or art critics of today that proportion in architecture is something to be comprehended and grasped and used as a science or a system, and not to be experienced as a dream or inspiration. It is a part of the architect's training to think of design as a trick of the trade. As a student he is asked to present a sketch for a commemoration monument. For such a problem he goes to the triumphal arch of the Romans or the Monument of Lysicrates, or to some other design that he appreciates as good, though he does not know why, and he works out a copy with a variation —what he would call in modern slang a "cold crib" —and the proportions may be right or wrong; he has no way of checking it up except by the verdict of those of more experience who may call his monument a "first mention," or pass it by without remark.

In our modern building we use mechanical methods undreamed of by the constructors of pyramids, temples and cathedrals. Never has there been greater activity in monumental building or greater skill in construction. But on the side of proportion we have made no advance; beauty has failed to keep pace with utility. Little of our work will stand the test of time artistically, and none of it will rank with classic precedent.

The thoughtful architect of today is questioning and is discovering. He knows that architecture is now acknowledged as a fine art, as one of the greatest if not the greatest of the fine arts. As an artist he is aware of the lack of good proportions in the buildings around him and conscious of the beauty of the best work of the past. Such a contrast stimulates his mind to inquire whether the good qualities of work in the past were obtained by lucky experiment or by some scientific method unknown to him. A definite question is in his mind. Was there not a body of rules or fundamental principles underlying the proportion of architectural forms in the past?

If he turns back to the one piece of documentary evidence of Roman times, to the book of Vitruvius, written in the golden age of the Roman Empire, he will read in the second chapter of the third book: "There is nothing to which the architect should devote more thought than to the exact proportions of his building, with reference to a certain part selected as a standard." But Vitruvius tells him only what was good to be done; he never explains how this can be done, assuming in us a familiarity with rules which at his time were the common property of the profession. Of the various attempts to formulate these principles the one most familiar to the modern architect is the article on "Proportions" found in Viollet-le-Duc's *Dictionnaire Raisonné*, Vol. VII, p. 532. In this discussion Viollet-le-Duc emphasizes the fact that good proportions depend not only upon the relations of cardinal dimensions, but also upon the relations between the primary and subordinate features of a structure. He crystallizes his ideas into the well known "theory of triangles." After marshaling an imposing array of classic specimens of architecture, he tries to prove that one of his set of three definite triangles was used as the fundamental figure of design by the creator of each.

Although Viollet-le-Duc suggested a splendid working theory, he has fallen short of the mark by failing to make it sufficiently general to be applicable to all forms of architecture. The fact alone that he limits his theory to three fixed triangles is a handicap; indeed the triangle as a ground figure is

a poor choice since the eye can rarely comprehend at a glance all three apices of a triangle, and beauty of proportion cannot depend upon a number of points which the eye is unable to see at one time.

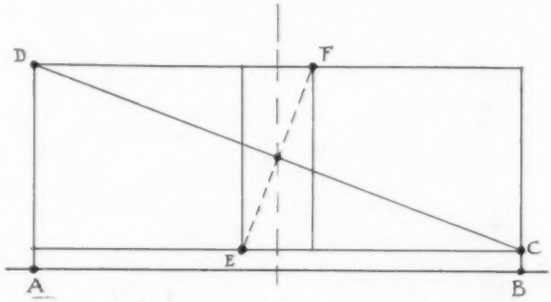
A present-day development, in reality an amplification of Viollet-le-Duc's theory, has been worked out by Prof. August Thiersch, who contends that good proportions are based upon similar rectangles, the diagonals of which are parallels, the two diagonals of any rectangle forming triangles, but not necessarily of Viollet-le-Duc's three types. Prof. Thiersch brings forward a long list of examples to prove his contention, with illustrations taken chiefly from the monuments of Greece and Rome, but also from the works of the middle ages and from the renaissance period. He shows, for instance, that on the Temple of Athena at Ægina, the entablature, two adjoining stones of the architrave, the abaci of the caps, the triglyphs, capitals, and the mutules with their supporting bars, all form rectangles whose sides bear the relation of 1 : 6. Another of Prof. Thiersch's examples is the Villa Farnesina where the wing of the villa, the two orders, the windows and their architraves, all form similar rectangles, the ratio of their dimensions, however, being impossible of expression in simple numbers. (See diagram.)

In discussing the problem Prof. Thiersch contends that harmony in design consists in the repetition by the subdivisions of the basic figure of the structure; in other words, in the analogy of the part to the whole. This ground figure, although not necessarily pleasing in itself, by repetition produces an effect agreeable to the observer, and the individual impressions received by the eye are merged into a pleasing composite. The simpler the relations of the parts to one another, and the oftener they are repeated, the more easily can the mind grasp the total effect. He adds, however, that mere repetition of similar figures, without contrast and variation, would soon become colorless and tedious, and that the mere application of a rule can never create a masterpiece.

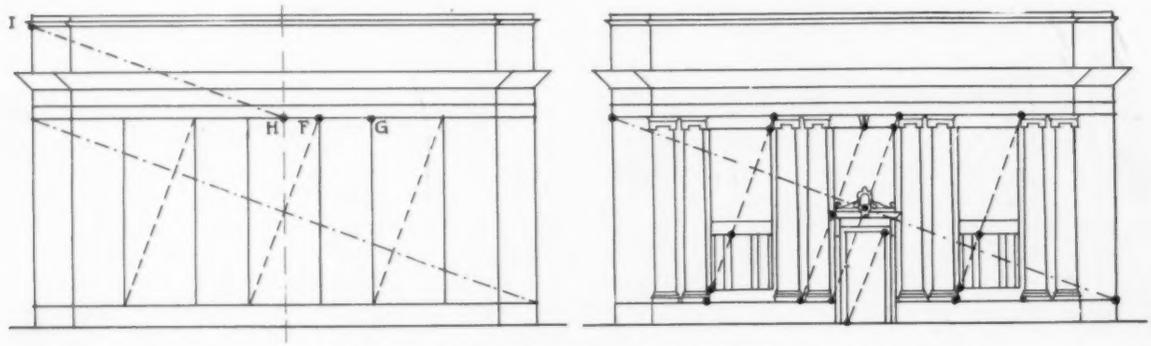
This theory is an advance over Viollet-le-Duc's, for it frees us from the limitation to three definite triangles. Moreover it contains a new and more comprehensible idea, since it emphasizes the rectangle as the ground figure, and the rectangle is the constantly recurrent figure in architectural design. Yet it remains a theory based on a ground figure, and therefore only too often dependent on imaginary points.

One readily observes that the few other discussions of this problem, like the two already mentioned, concern themselves fundamentally with oblique lines, whether their proponents call these lines sides of triangles, diagonals of rectangles, or by any other name. This similarity is so striking as to lead to the belief that the advocates of all these have based their theories upon certain theoretical lines found in a number of mediæval drawings handed down to us, lines which we must feel were drawn for the purpose of determining the proportions of buildings of different types.

Take, for instance, the different cross sections drawn by Stornalocho in 1391 for the then proposed Cathedral of Milan, of which one is shown here. Into these cross sections are drawn a series of similar isosceles triangles. These have their bases on the floor line while their legs start either in the centers of the piers or of the aisles, and after passing through the spring lines of the vault arches, end in the



AB = WIDTH OF PROPOSED BUILDING
AC = HEIGHT OF BASE
BD = HEIGHT OF CORONICE, DETERMINED BY NECESSARY HEIGHT OF MAIN BANKING ROOM
CD AND EF PRIMARY AND SECONDARY DETERMINING LINES OF DIRECTION
FG = WIDTH NEEDED FOR DOUBLE ORDER
HI = HEIGHT OF BUILDING DETERMINED BY SHADOW LINE OF PARAPET CORONICE

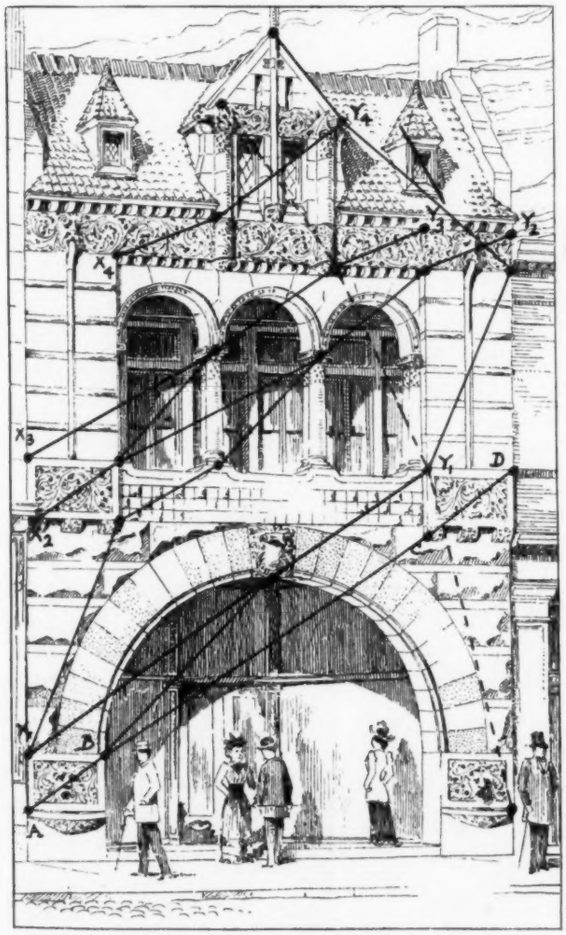


Diagrams Showing Development of Design of Building for Malden Savings Bank, Malden, Mass.

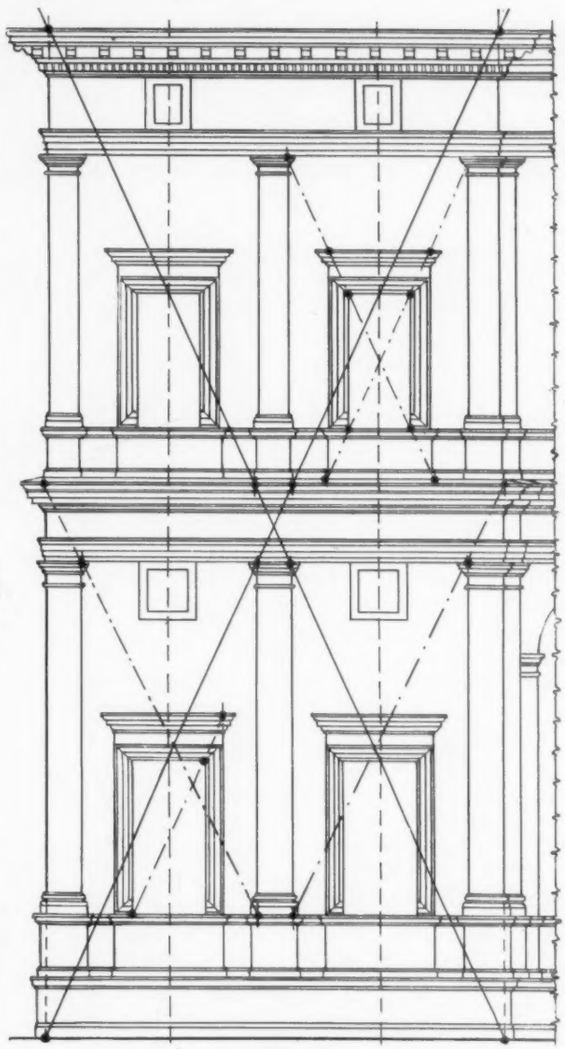
Monks & Johnson, Architects and Engineers

apices of the vaults of nave and aisles respectively. Not only are such triangles or diagonals preserved in the few mediæval drawings we possess, but they can readily be drawn into sections and elevations of countless classic examples of architecture, as Viollet-le-Duc has amply shown, and this is true not because the architects of those buildings worked with mystic figures or numbers, but because they recognized a fundamental fact of psychology.

In everyday life this principle is constantly made use of. Take, for example, the checker board; everyone appreciates without effort its regularity and would instantly detect a unit dissimilar to the rest. Likewise, the windows of an elevation are arranged in horizontal and vertical rows unless the designer wishes to stamp some special feature upon the attention of the observer. When the eye views checker board or facade it does not travel back and forth along the horizontal or vertical rows of units, but instinctively sweeps the diagonals of these, attracted by the corners of the individual features, rather than by their fields. As each corner of a door or window is a fixation point for the eye, so every base, cap, buttress offset or similar prominent feature draws the attention. We call a window high or low according to the relation between height and breadth, *i.e.*, according to the pitch of the diagonal, which is but the resultant of these two dimensions. Through taking advantage of this habit of the eye and brain the architect can guide the glance of the observer by the design of his structure. If he arranges cardinal points on parallel oblique lines, the eye can travel along a natural path — the diagonal — gaining at a glance the resultant which is the relation of the two dimensions, height and breadth.



A, B, C, D, is a good "determining line of direction." The broken lines might easily have been straightened into "parallels of direction"



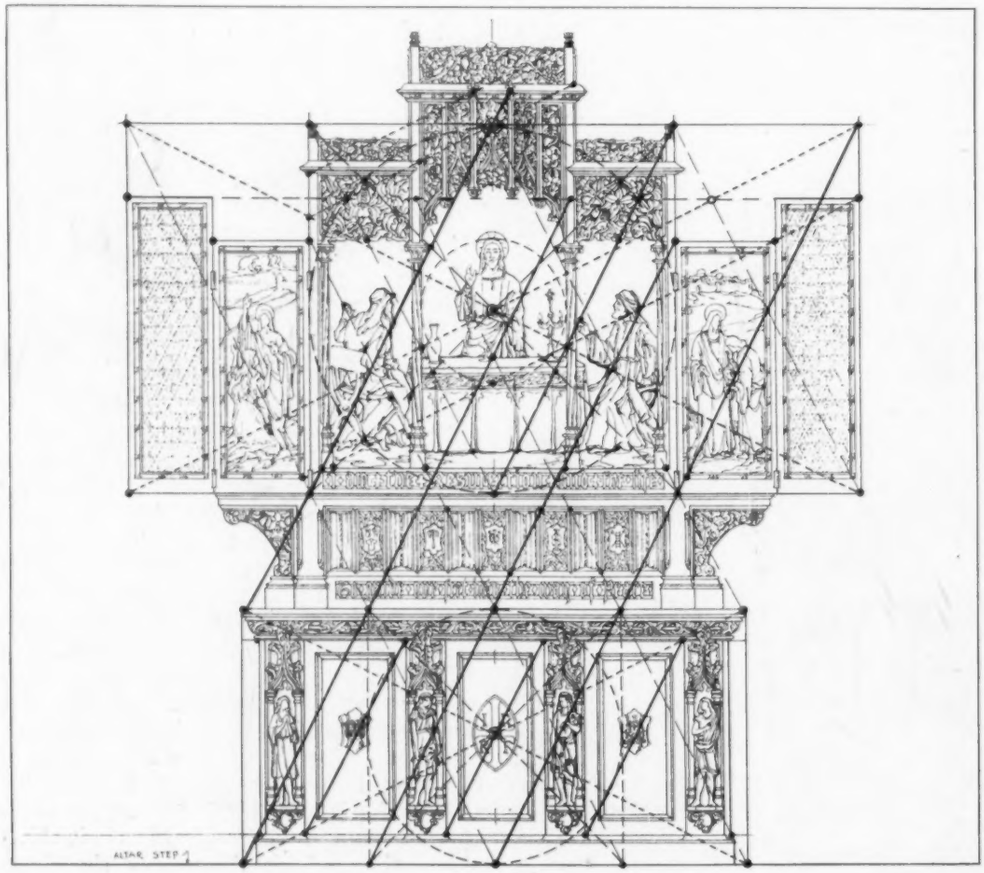
Wing of Villa Farnesina, Rome
Facsimile of drawing by Prof. August Thiersch

After sketching roughly a facade, and locating the features fixed by necessity, it is an easy matter to adopt a diagonal which shall serve as the "determining line of direction." (See illustration of bank design.) The chord of an arc, or the diagonal of a dominant rectangle furnishes in itself a decided oblique line. This determines the slant of the diagonals on which subordinate points must be located in order to give the observer the feeling of quiet and satisfaction called beauty. In addition

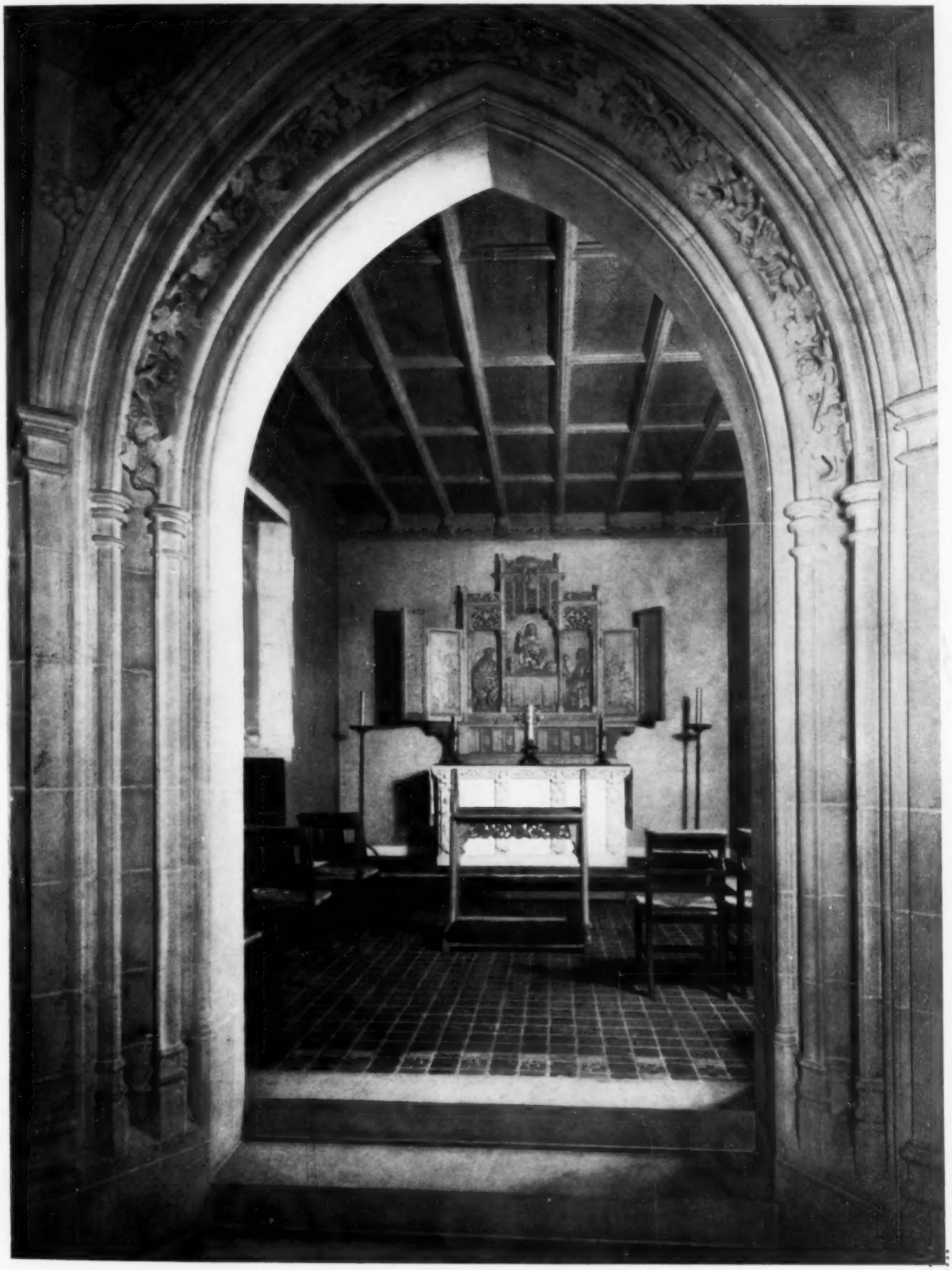
to this primary oblique line or "determining line of direction," the perpendicular to it will prove useful. Parallels to these two lines might be called "primary and secondary diagonals," and important corners should be located not only in the path of the primary, but also of the secondary series, and their intersections. These two sets of lines are distinctly interrelated and helpful one to another. The use of these lines will save the designer endless experiment in locating belt courses, cornices, window levels or such ornamental features as he may wish to introduce into his elevations. To the practical man the application of these principles may at first appear a waste of time. After a little study, however, he will discover that he can save the time formerly spent in going over and over his drawings, feeling after something which can be had by the application of a simple rule.

Just as the "determining line of direction" guides the eye in its wanderings over a facade, a circle will naturally catch it and fix it upon a certain feature. If, therefore, it is desirable to confine the attention of the observer to a limited field, circles or a series of other concentric figures may be introduced; even the discredited square here becomes desirable. It is remarkable how often this form may be detected in classic buildings, carefully camouflaged it may be, but still there, to do its duty in the eye of the observer.

Every architect will admit that similarity of proportions and the proper arrangement of individual features are fundamental requisites of a pleasing picture — indeed they are elements of beauty. No rules will make up for a want of genius, and no application of a principle will create a master architect, yet a knowledge of such rules will be of service to talent and shorten the long and weary road of experimentation. The result of a little effort spent in arranging dominant and subordinate features of telling members on "determining lines of direction" is truly surprising. Such purposeful application of a few simple principles is sure to enrich the artist's design with the desired grace and harmony. No longer need the eye of the observer zigzag wearily hither and thither over a facade in the effort to comprehend its general effect. The eye will glide easily along the lines of least resistance, intentionally chosen by the architect for this purpose, and will receive one harmonious impression with that pleasure afforded by a successful design.



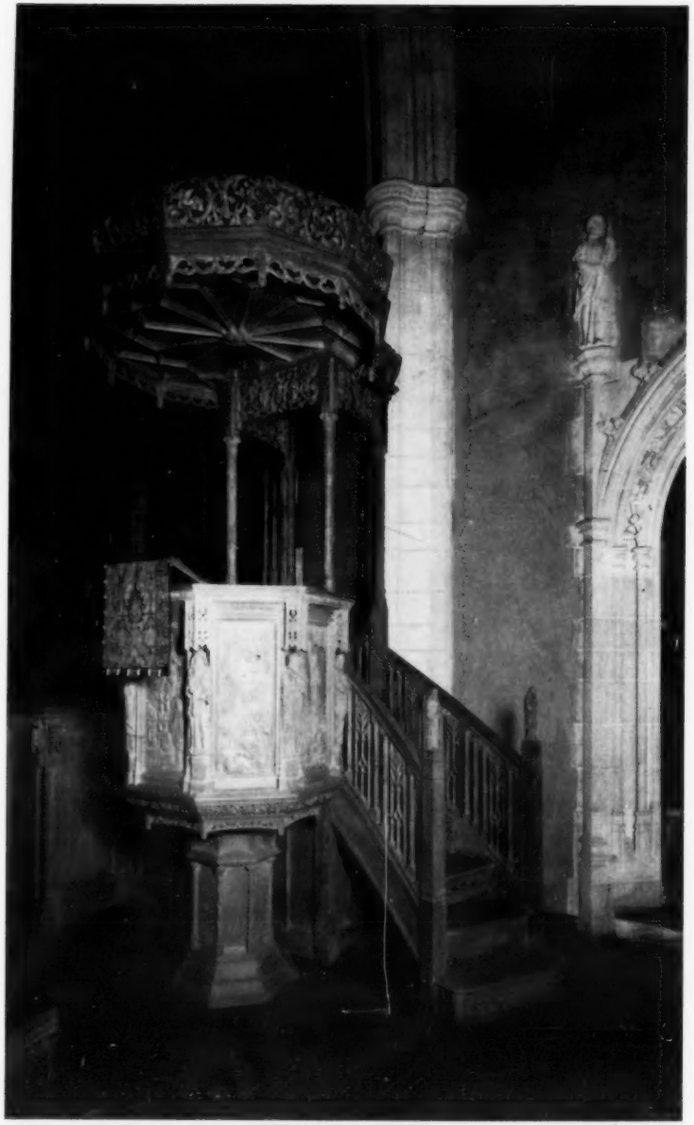
Altar and Triptych, Emmanuel Church, Baltimore, Md.
Woldemar H. Ritter, Architect
Note parallels of direction, both primary and secondary; also the two focal points in altar and triptych



VIEW OF CHAPEL FROM AISLE OF CHURCH

PEACE CHAPEL, EMMANUEL CHURCH, BALTIMORE, MD.

WOLDEMAR H. RITTER, ARCHITECT



DETAIL OF PULPIT

DETAIL OF CHAPEL ALTAR

PEACE CHAPEL, EMMANUEL CHURCH, BALTIMORE, MD.

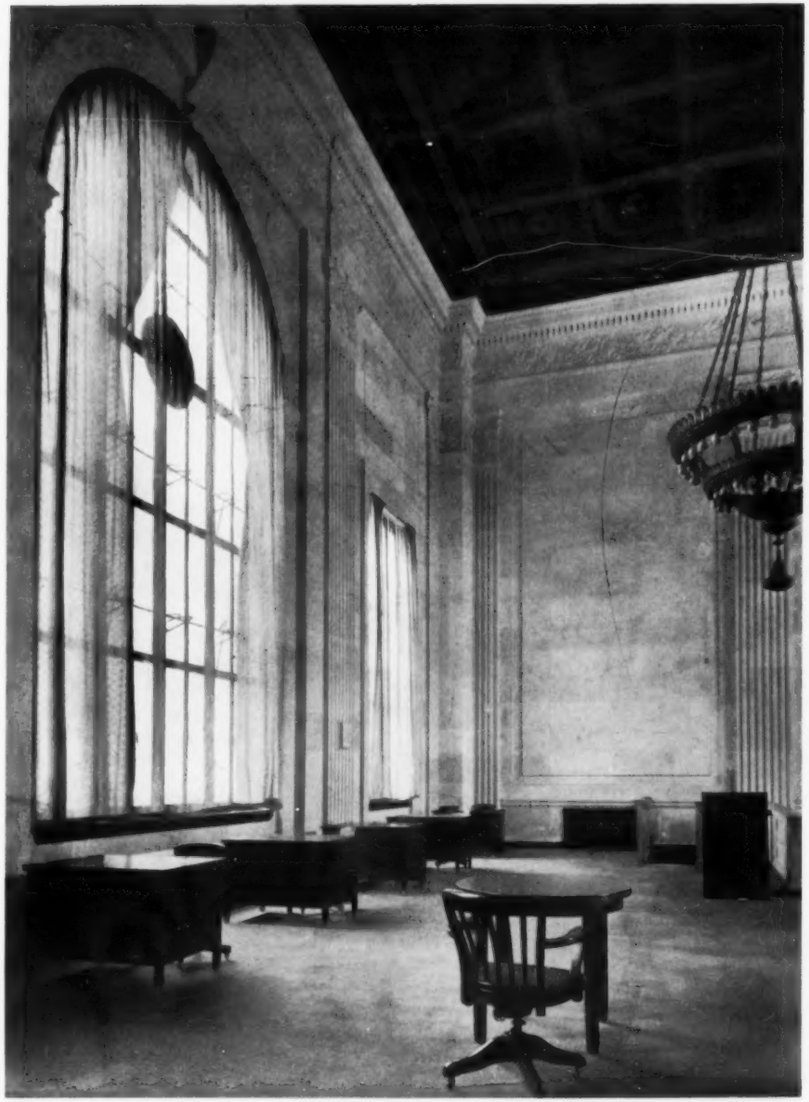
WOLDEMAR H. RITTER, ARCHITECT

EXTERIOR VIEW

DETAIL OF ENTRANCE

VIRGINIA TRUST COMPANY BUILDING, RICHMOND, VA.

ALFRED C. BOSSOM, ARCHITECT



BALCONY OVER VAULT

INTERIOR OF BANKING ROOM

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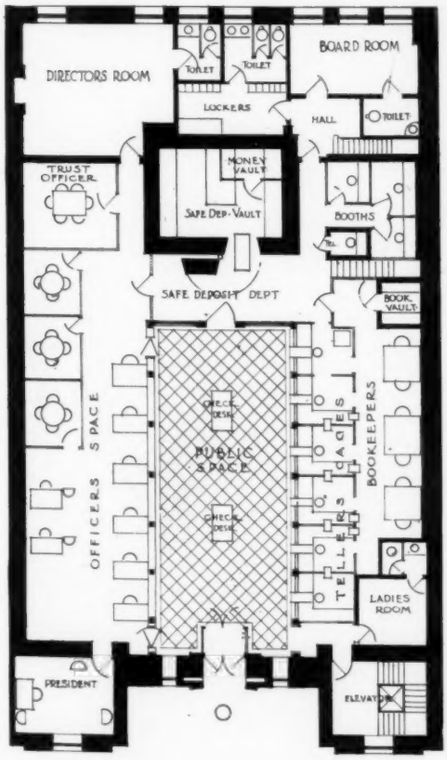
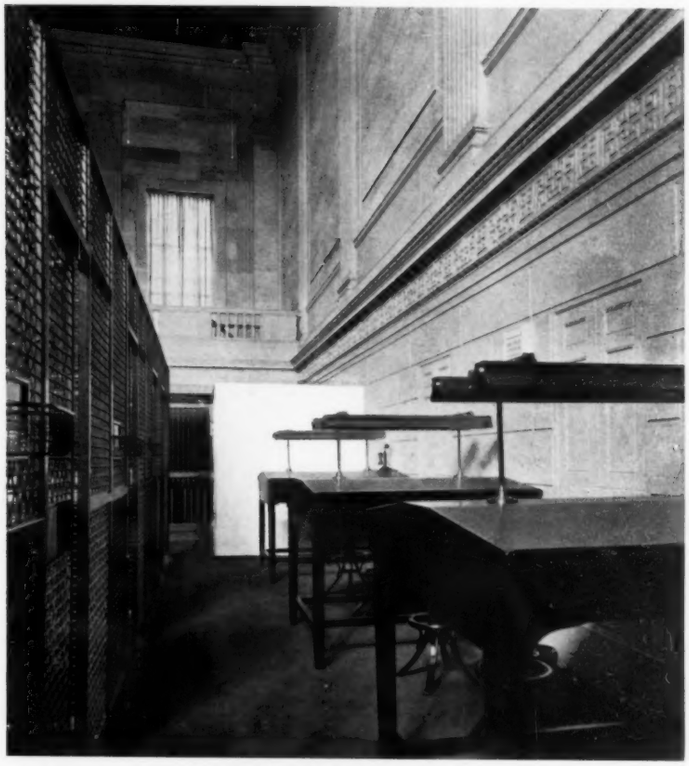
VIRGINIA TRUST COMPANY BUILDING, RICHMOND, VA.

ALFRED C. BOSSOM, ARCHITECT

ENTRANCE TO SAFE DEPOSIT VAULT



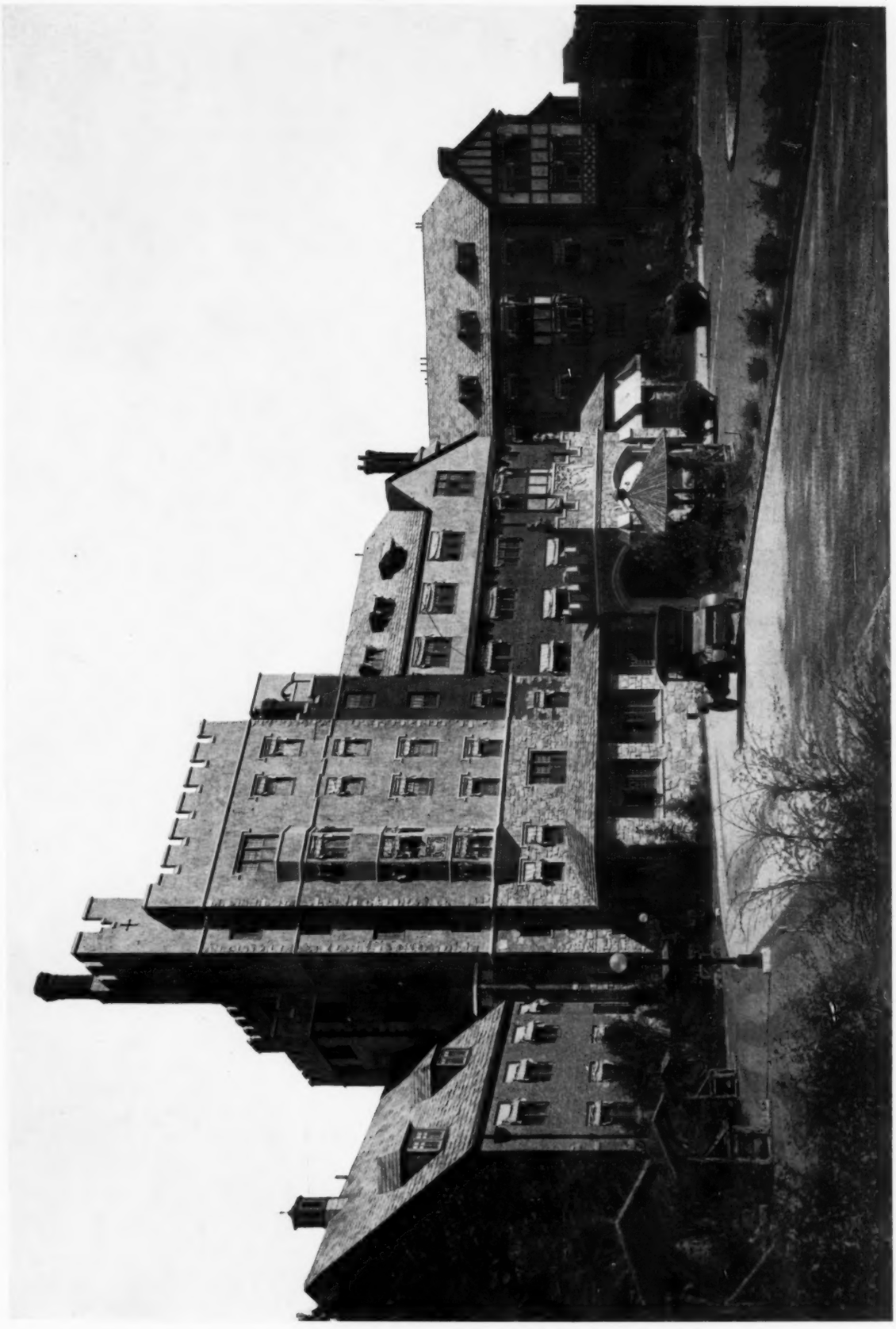
FIRST FLOOR PLAN



VIEW IN WORKING SPACE

VIRGINIA TRUST COMPANY BUILDING, RICHMOND, VA.

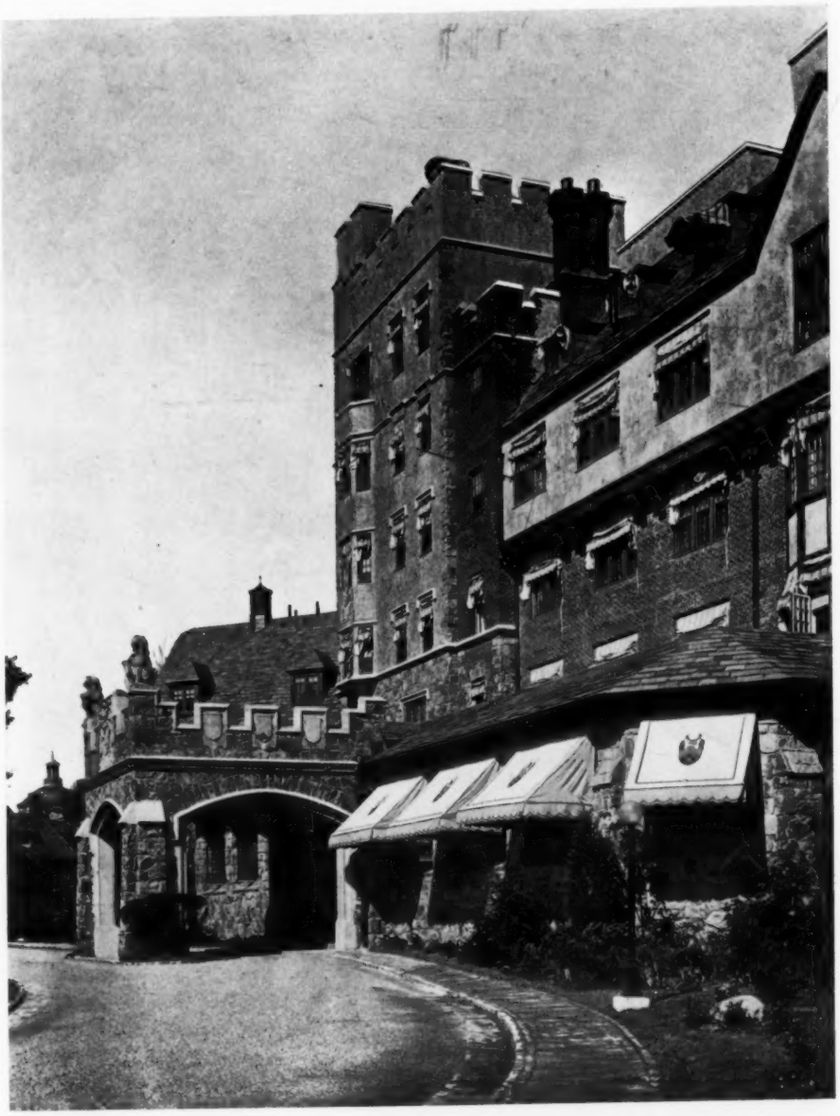
ALFRED C. BOSSOM, ARCHITECT

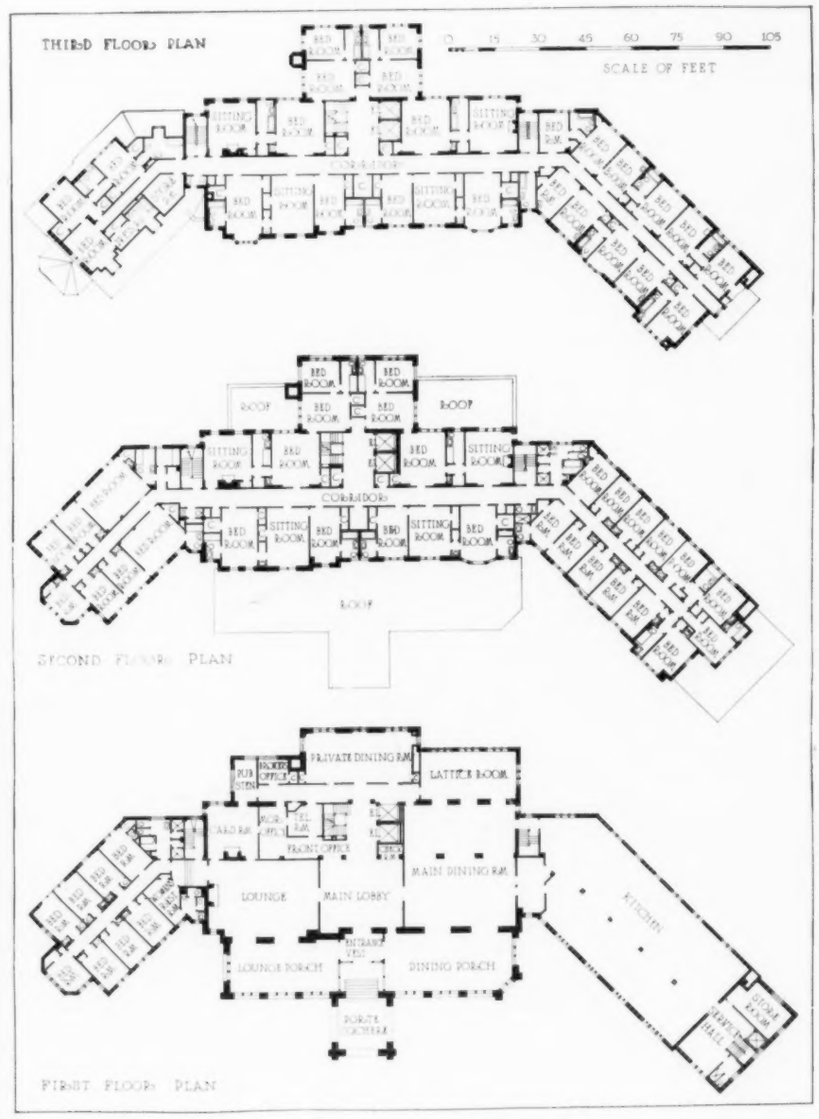


GENERAL EXTERIOR VIEW

PICKWICK ARMS HOTEL, GREENWICH, CONN

FRED F FRENCH COMPANY, ARCHITECTS

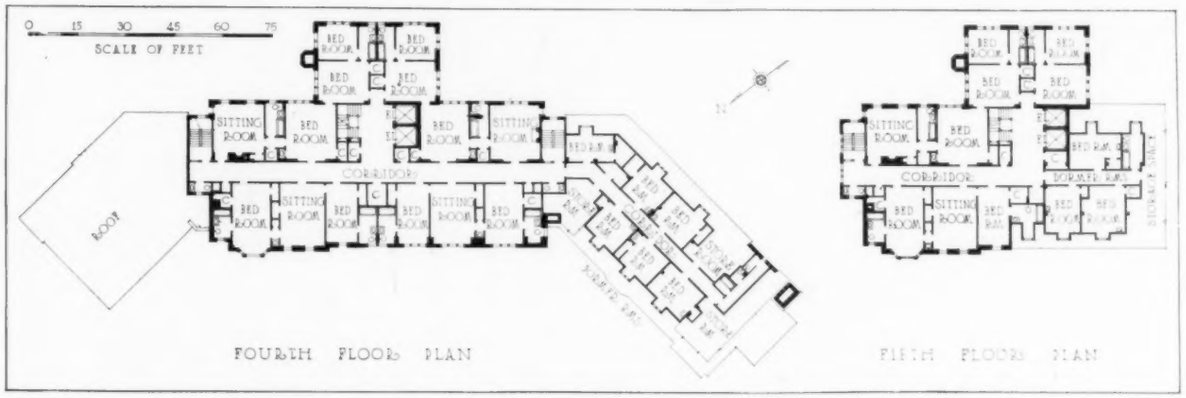




PICKWICK ARMS HOTEL, GREENWICH, CONN.

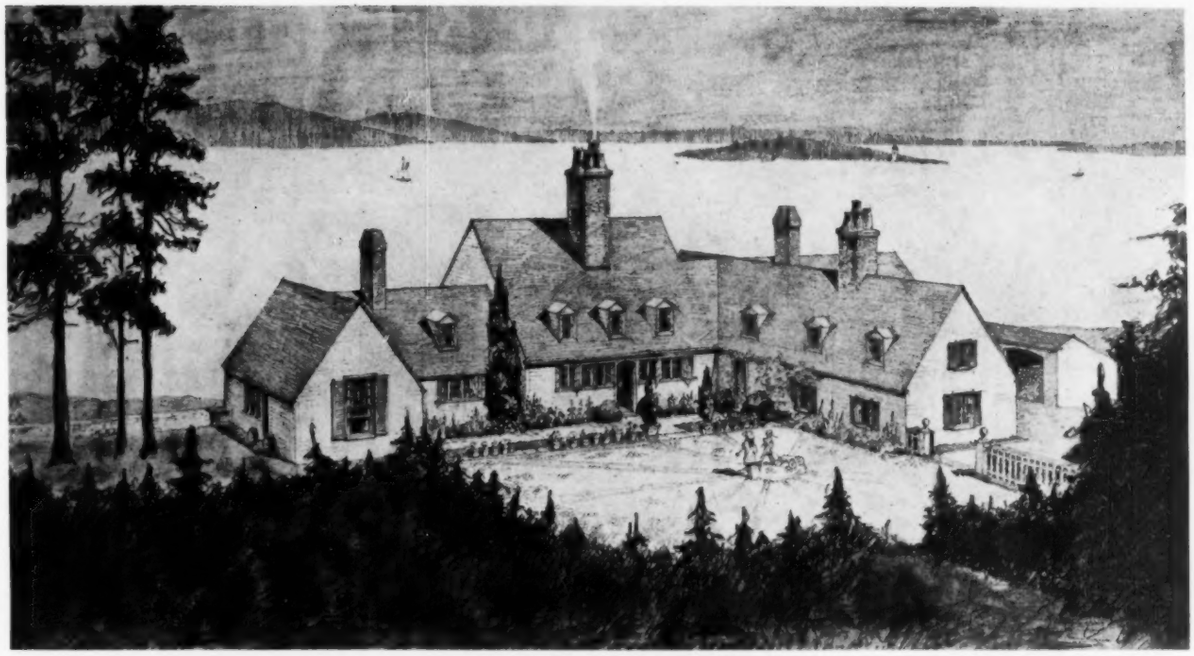
FRED F. FRENCH COMPANY, ARCHITECTS

VIEW FROM DRIVEWAY

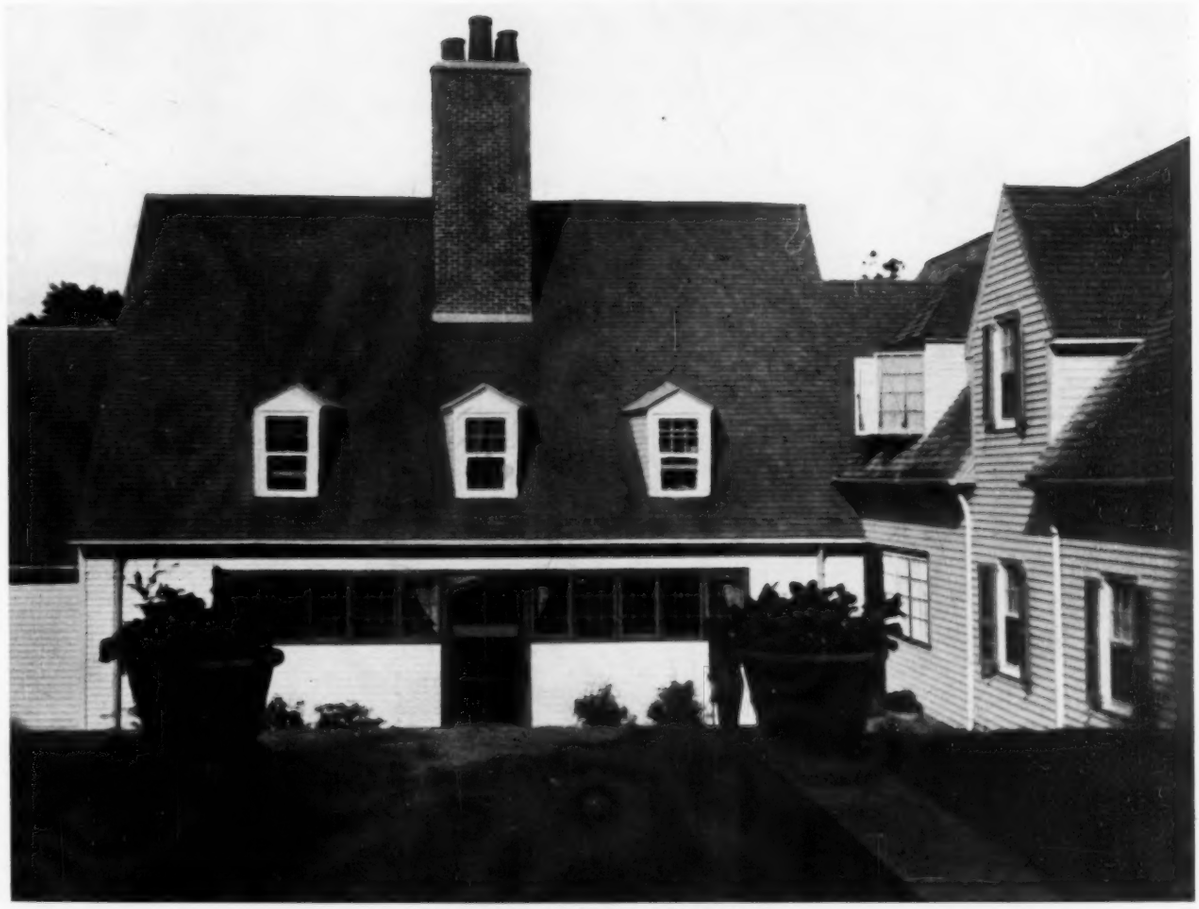


PICKWICK ARMS HOTEL, GREENWICH, CONN.

FRED F. FRENCH COMPANY, ARCHITECTS



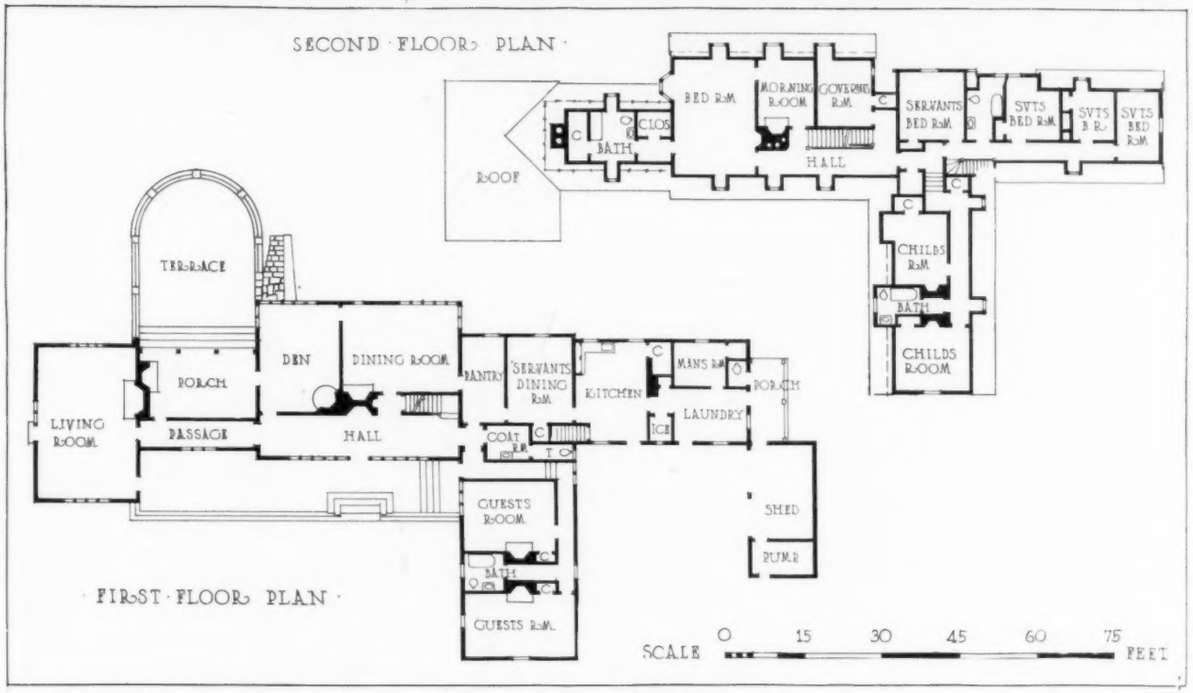
SKETCH OF ENTRANCE FRONT



ENTRANCE FRONT FROM FORECOURT

HOUSE OF MRS. A. J. ANTELO DEVEREUX, DARK HARBOR, ME.

MELLOR, MEIGS & HOWE, ARCHITECTS

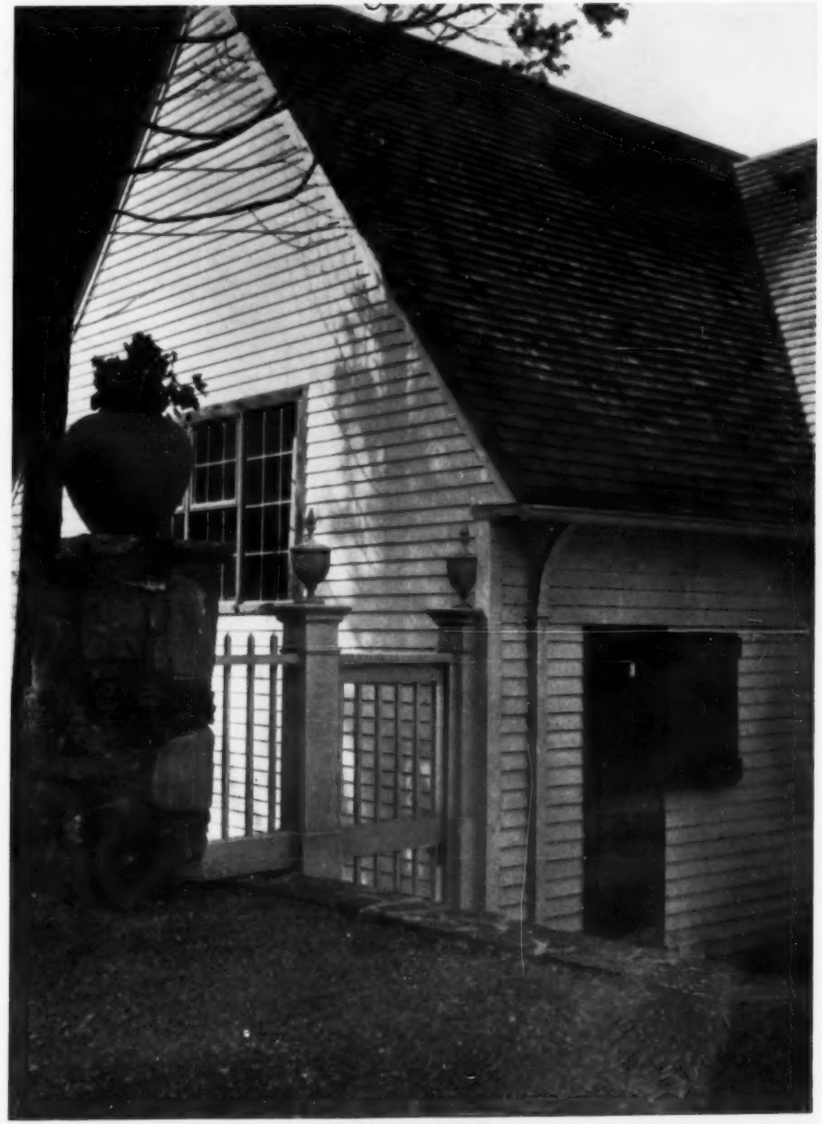


WATERSIDE OF HOUSE

HOUSE OF MRS. A. J. ANTELO DEVEREUX, DARK HARBOR, ME.

MELLOR, MEIGS & HOWE, ARCHITECTS

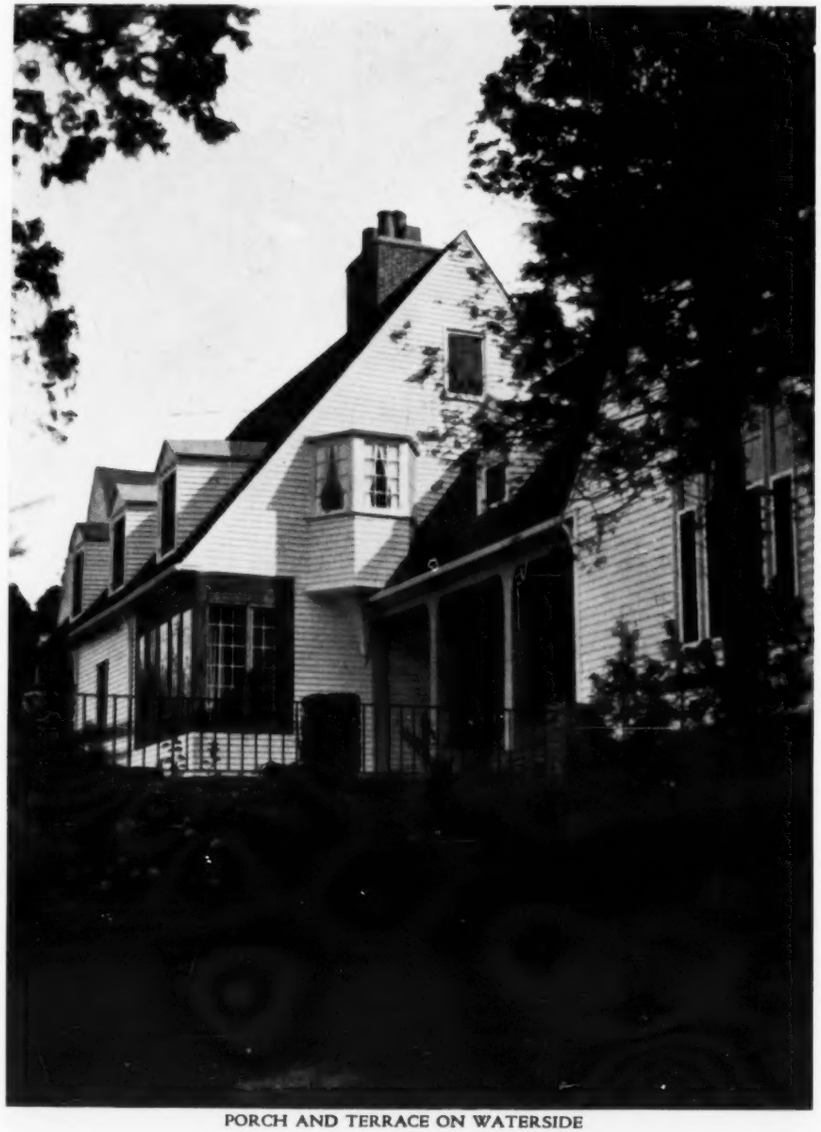
VIEW OF GUEST WING



LIVING ROOM GABLE

HOUSE OF MRS. A. J. ANTELO DEVEREUX, DARK HARBOR, ME.

MELLOR, MEIGS & HOWE, ARCHITECTS



PORCH AND TERRACE ON WATERSIDE

ENTRANCE TO GUEST WING

HOUSE OF MRS. A. J. ANTELO DEVEREUX, DARK HARBOR, ME.

MELLOR, MEIGS & HOWE, ARCHITECTS

Land Drainage

How It Affects Architecture and Landscape Architecture

By F. W. IVES

Professor of Agricultural Engineering, Ohio State University, and President of the Agricultural Engineering Company

THIS is the first of a series of articles to be presented in THE FORUM *by members of the Consultation Committee on their respective subjects. Others will appear in subsequent issues regularly.* — THE EDITORS.

THE success of a building project, whether it be a country house, a country club, or a farm building group, from an architectural standpoint, depends in no small measure upon the development of its surrounding plant life, and in turn plant life, roads, drives, building foundations and sewage disposal systems are dependent upon soil conditions for their success. Good drainage is the foundation stone of proper soil conditions upon which rests success or failure of any of the types of construction just mentioned.

When handling the drainage about farm or other country buildings, the questions of ground water and natural water table in the soil are likely to be left unsettled for the immediate problems of roof water, cellar drains, road drains and sewage disposal. Ground water is considered to be a matter for the agriculturist alone, as it is supposed to affect only plant growth.

As a matter of fact, however, if ground water is properly taken care of, the drainage of roads and buildings is a much simpler problem. The mere drainage of soil, from an agricultural standpoint, changes various soil characteristics and such drainage:

1. Raises soil temperature.
2. Aerates the soil, introducing nitrifying bacteria.
3. Oxidizes and makes available plant food.
4. Lowers water table permanently.
5. Establishes channels for flow of ground water.
6. Makes soil more friable.

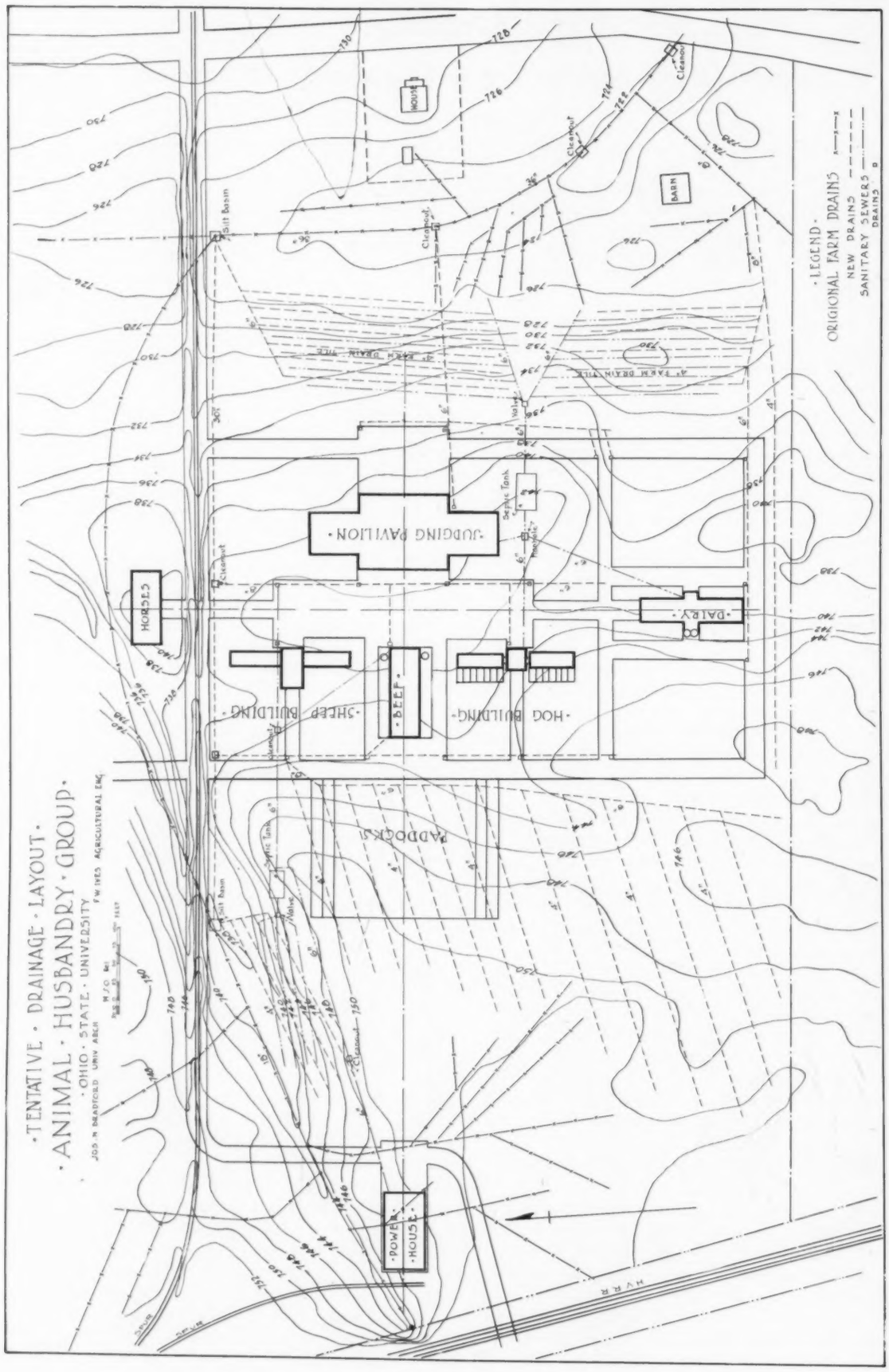
All of this has a direct bearing on construction and related activities:

1. Higher soil temperature aids landscape architecture by making possible earlier plant growth in spring; enables the architect and builder to start building construction and road work earlier in season.
2. Soil aeration assists in the sanitary disposal of household and barnyard wastes by the economic process of sub-surface irrigation secondary disposal systems.
3. Oxygen in the soil assists in final disposition of septic tank effluent.
4. Lowered water table makes better and more permanent road foundations; prevents dampness in cellars or basement stories; prevents large surface run-off by increasing absorptive capacity of the soil; affords better conditions for plant growth for practically all ornamental high ground shrubs and decorative plants.
5. Channels for flow of ground water are established within a year after installation of tile drains and make for rapid drying of tennis courts, golf grounds, roads, etc., after heavy or severe rains.
6. Drainage changes the nature of soil by making it more workable. The changed soil makes more easily cared for courts, gardens and other forms of landscape construction.

Another general consideration is the protection of water supply by artificial drainage. Such drainage may be used in several distinct ways, of which disposal of surface run-off and sewage wastes are the most important. The control of surface run-off consists mainly in taking care of the occasional freshets in natural water courses after a heavy rainfall, thus preventing flooding of springs and consequent fouling of water supply. The control of surface run-off also prevents erosion of natural or artificial landscape constructions. The sanitary disposal of sewage by the sub-surface irrigation method is quite satisfactory so far as irrigation and avoiding the pollution of air are concerned. In a very wet season, however, sub-drainage of the irrigated section must be installed in order to take care of excess water and direct its flow from channels leading to natural sources of water supply, such as springs and wells, and toward such channels as legal drainage restrictions may designate. The effluent from the sub-irrigated beds is generally not dangerous to health except under extraordinary conditions or because of poor design of the plant at the outset, but there is always a feeling, hard to overcome, of prejudice against waters emanating from such sources.

Other problems intimately associated with drainage in their solution are those of efflorescence on retaining walls; overturning of retaining walls and garden ornaments by action of frost; destruction of walks and drives by frost; winter damage to swimming pools, fountains and similar details; care of barnyard waste, sunken gardens and sunken farmyard courts; inundation of golf courses and country club grounds by streams.

The first care of the engineer in planning an adequate drainage system is to provide an outlet; the second step is a careful topographical survey of the whole drainage area and the next step is then a study, with the architect and the landscape architect, as to the location of buildings with respect to topography and their relations to one another. The last step before beginning construction is the prep-



MAP OF PROPOSED AGRICULTURAL SECTION OF OHIO STATE UNIVERSITY

JOSEPH N. BRADFORD, UNIVERSITY ARCHITECT; F. W. IVES, AGRICULTURAL ENGINEER

aration of plans and details. The outlet is most important on account of state laws covering riparian rights and damage by artificial water courses, and also on account of sanitary rules of state and city boards of health. Almost as old as the ancient fence feuds are the questions of receiving drainage from the uplands of a neighbor. A topographical survey of the whole drainage area is necessary for three reasons: (1) To plan properly the drainage of the area under consideration. (2) To determine, so far as possible, the effect of run-off from land higher up. (3) To ascertain the legal restrictions pertaining to outlet on the property below. Many times the question of flow from higher property is more serious than that of the drainage from the site itself.

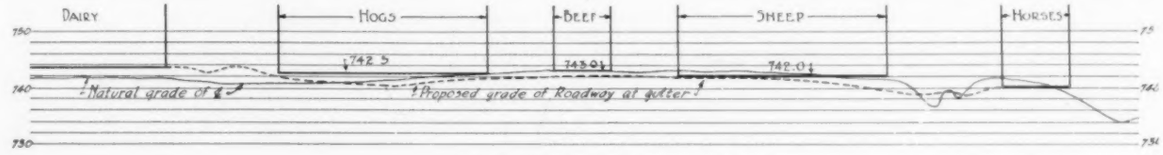
Naturally enough the architect, landscape designer and engineer must agree as to the proper relation of site and buildings. A few general principles on which to base agreements should be understood in connection with farm groups:

1. Drainage should be from residence to barn rather than from barn to house.
2. Drainage should protect all sources of water supply.
3. Southern or eastern slopes are most suitable for all farm buildings.
4. Prevailing winds determine to some extent locations of buildings, *i.e.*, stable odors should be carried away from the house.
5. Questions of drainage affect location of all drives, walks, tennis courts, sunken gardens and barnyards.
6. Economic working of farm plant, though sometimes overlooked in favor of a "picture farm," must not be neglected. Few country places pay money dividends, nevertheless many large estates do pay their own way, which doubtless contributes not a little to the peace of mind of their owners.

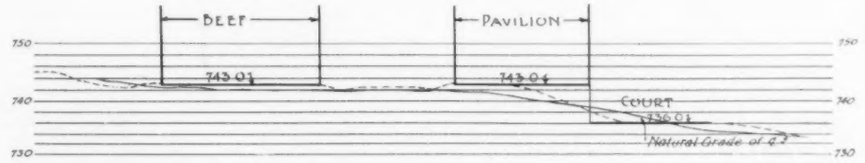
A typical drainage problem relating to a farm building group is found in the proposed group for the Animal Husbandry Department, Ohio State University. This problem involves run-off from property above, drainage of fields about the plant, drainage outlet, sewage disposal, drainage of disposal field, and omits only the drainage as affecting the water supply. The topography of the site, as shown in the map, is of a medium rolling character with no very steep slopes. The soil is a heavy clay, very dense and inclined to hold water. Drainage from approximately 400 acres above flows through a culvert under a railroad at the west of the tract. This flow was originally conducted in an ordinary field drain, not sufficiently large to carry freshets. The remainder of the original drainage on the tract is barely sufficient to permit the land to be cultivated, no pretense at complete drainage being made. In the consideration of this problem, the former drainage system has practically no bearing excepting that a portion of it will have to be replaced with units of larger capacity.

The building location and the relative positions of the various structures with respect to management, capacity and ornamentation and the preliminary studies for the building plans were worked out in the office of Joseph N. Bradford, University Architect, with the Departments of Animal Husbandry and Agricultural Engineering in consultation. The group and its location having been decided upon, the problem of drainage was then taken up. It was first thought that the drainage from the higher ground could be diverted along the railroad to another outlet, but this was abandoned after study. It was found that a 12-foot cut for a distance of 700 feet would be necessary. The railroad officials do not care to change the size of existing satisfactory culverts under a double track. Property owners receiving the increased run-off naturally expect a state-operated plant to pay large damages (alleged) to their property. In other words, riparian rights of a public utility and of individuals were involved.

Study of this problem indicated that a 30-inch



"PROFILE" SECTION"
On North & South Axis or ℄ as shown on plan



"PROFILE" SECTION"
On East & West Axis

sewer would carry the surface and ground drainage with a fair factor of safety. This sewer is provided with silt basins and clean-outs at points of change of grade, curvature and entrance of other drains. These are important matters in the carriage of waters laden with silt materials. Silt basins provide simply an enlarged and deepened channel where the abrupt entrance and exit of the water encourages the deposit of silt and sand. Man-hole and clean-out covers must be provided. The main sewer purposely follows the main roadway to take water from the gutters and surface inlets. At its lowest point the 30-inch main sewer is joined by a drain from some 200 acres to the north and then proceeds in a southerly course, passing under the river boulevard and finally into the river.

Four other typical drains are found:

1. Drains for water from roofs, paved courts and roadways.
2. Drains to lower ground water table about site.
3. Sanitary drains.
4. Sub-drainage of sanitary disposal fields.

The water from roofs, paved courts and roadways is carried by direct underground lines to the nearest convenient outlet. Regular inlets are provided at convenient intervals to guard against possible flooding. Six-inch tile are the smallest recommended for this service. Small tile are of little value as they soon become clogged and useless. Lawns and tempers are both ruined by tile replacement.

The drains for lowering water table serve several purposes in this particular case. The most extensive drainage is necessary just west of the group on ground of a higher elevation. These are ordinary 4-inch farm drains laid down the slope to a sub-main. Their purpose is to intercept ground water and to prevent surface water from reaching the courts and yards. It is believed that this drainage will better the grass in the large paddocks. Other intercepting drains are shown on the map. Since a dry yard is especially desirable in the case of sheep and dairy cows, underdrainage is very necessary.

The sanitary drains include vitrified sewer lines from the various buildings to the large septic tanks, of which there are two. The larger tank is designed to care for toilet and wash from the dairy barn, hog building and judging pavilion. The smaller of the two will take care of a comparatively small amount of waste from the sheep and beef cattle buildings and from the power plant, this latter built to include a small abattoir. Vitrified drains from the septic tanks to the dividing valve chambers are quite necessary in order to prevent pollution of the soil at that point. The disposal field consists of common farm drain tile, minimum size 4 inches in diameter. These tile are laid at a slight slope in cinders or gravel at a depth of about 18 inches from the surface. In closely compacted soils, the cinders or gravel should be 12 inches below the tile and 6 inches on either side, and should be covered with just enough soil to grow whatever crop is necessary. In gravel or sand, sub-drainage of disposal fields is not necessary unless some source of water supply is to be protected. In wet, heavy soils, particularly in regions of heavy rainfall, sub-drainage is extremely important. The heavy soil tends to become waterlogged and would soon kill off desired plant growth. Plant life over the beds to utilize the excess of nitrogen deposited by the sewage is necessary. Vigorous growth can take place only under favorable moisture conditions.

The map clearly shows three disposal beds of ample area. The sub-drainage is shown as a grid-iron formation. The sub-drains may usually be constructed of 3- or 4-inch farm drain tile from 30 to 40 inches below the natural ground surface, depending upon the available gradient, and midway between the disposal lines. All sanitary lines must be laid with a grade of ⅛ inch per foot or more. Vitrified sewer lines must be carefully graded and laid with cemented joints. All disposal tile and all drainage and sub-drainage tile must be laid with loose joints. Valves are provided so that portions of the disposal field may have periods of rest, since a continuous flow would soon render the plant inoperative or at least not safe.

Economical construction of drains is a matter of interest to the architect and owner as well as to the contractor. Drainage excavators or trenching machines are more economical than hand work on all save the smallest jobs. The cost of an installation of the size shown on the map may be cut 30 to 50 per cent by the use of machines in place of hand labor. It is important that, so far as possible, parallel lines be employed and that these lines be as long as grade conditions will permit. A good operator can finish a grade to a smaller fall with greater accuracy than most hand workers, and with much less supervision and inspection.

Two kinds of tile are available — clay and concrete. Which is selected will be largely a matter of price, delivered at the site. Since freight plays a large part in present prices, the nearness of a tile kiln or a cement products plant will have considerable bearing on the price. Generally speaking, large sizes of concrete pipe are superior to the smaller sizes, while the reverse is apt to be true of the clay product.

These publications are of value in the study of design of drainage:

E. G. Elliott. *Engineering for Land Drainage*, John Wiley and Sons, Inc.

E. G. Elliott. *Practical Farm Drainage*, John Wiley and Sons, Inc.

J. A. Jeffrey. *Text Book of Land Drainage*, The Macmillan Company.

H. F. French. *Farm Drainage*, Orange Judd Company.

The Division of Agricultural Engineering, Bureau of Public Roads, U. S. Department of Agriculture, Washington, D. C., has issued much valuable material and research data on drainage and drainage design. Various state experiment stations have done much valuable work, data regarding results being available in bulletin form. Notable among these is the recent work of Michigan, Wisconsin and Iowa. The Proceedings and Journal of the American Society of Agricultural Engineers also contain much valuable material.

ENGINEERING DEPARTMENT

Charles A. Whittemore, *Associate Editor*

Steel Design for Buildings

PART II. THE DESIGN OF STEEL COLUMNS

By CHARLES L. SHEDD, C.E.

IN the May number of THE FORUM we considered the various types of columns and the points which were to be remembered in their design. In this number we will show a method of arranging the calculations for a column design and also the actual design of a column for a 12-story office building.

The loading on a column is made up of loads from several sources: 1st, the wall loads; 2nd, the live floor loads; 3rd, the dead floor loads; 4th, the column metal and covering, and 5th, any special loads such as from elevators, tanks, etc. In figuring these loads they are kept separate until the final summary is made in order that one can tell easily in that summary just how much of the total loading comes from each source. This may be especially useful in the designing of the foundations and in any case it makes the work systematic and easy to follow, and it also aids in estimating the effect of any changes and enables the person in charge of the work to look it over and note any possible error by comparison of the various totals.

In computing the wall loads, one sheet may be given to all the wall loads on all of the floors between any two columns. It is best to start at one corner of the building and work around the structure, taking each bay in order. The sketches for these wall loads are made in the same manner as those shown in the last article, where we considered the design of steel beams. Fig. 1 shows a typical sheet of wall loads. The wall is of brick, 1 foot thick, with a window 4 feet wide. The arrangement of the figures is similar to that in the design of beams but we stop when we have obtained the reactions and do not figure any moment. These calculations should be made before the spandrel beams are figured and then they may be used in conjunction with any floor loads to make up the sketches for the designing of those beams.

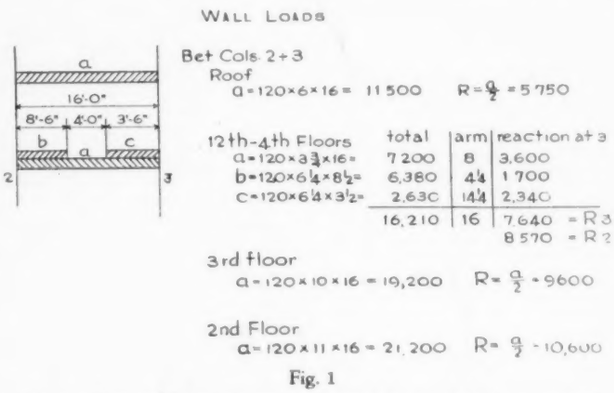


Fig. 1

NOTE.—This method of tabulation was explained in detail in a previous issue of THE FORUM

In Fig. 2 is shown a portion of a summary of these wall loads. This portion shows the summary of the wall loads for columns 1, 2 and 3. The building has 12 stories and the loads from the walls to the columns are all alike on the floors from the 5th to the 11th inclusive, so we bunch these all together to save time and space. The horizontal lines represent the spandrel beam at each floor and the vertical lines the columns, and the loads are entered from Fig. 1, etc. at each end of each beam and above it so that the work can be easily followed. Movable partitions are usually considered as part of the live load but permanent partitions may be figured and summarized with the wall loads. Column 3 has a load from a permanent interior partition, therefore there are 3 loads for that column on the wall load summary sheet. When these loads are all entered on the sheet they are added together for each column at each floor and the result placed below the horizontal line. It is convenient to let the vertical line pass between the hundreds and the thousands. The author usually

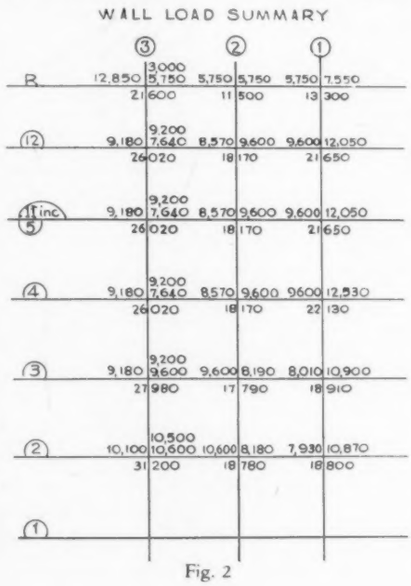


Fig. 2

makes the calculations thus far to the nearest 10 pounds, but when these are transferred to the final summary the nearest hundred or the next hundred above is generally used to facilitate adding up the items.

The live floor loads are figured as in Fig. 3, which shows a portion of such a sheet for the building we are using as an example. The 12th to 4th floors are all alike and are put together. The first vertical column shows the number of each column; the next 3 are areas of the various parts which make up the roof. These areas are figured from the plans and are the areas of floor in square feet which are transferred to each column. An easy way to figure these, where they are complicated, is to have blue prints of the framings made and mark quarter areas at convenient points on the plans similar to reactions of beams, and then follow them around, crossing off any as fast as they are divided into reactions nearer the columns. Finally the sheet will be covered with these numbers, crossed off excepting those around each column which may be added together on the blue print and that summary marked to distinguish it from the partials in some way, such as drawing a circle around it.

LIVE FLOOR LOADS FOR COLS.

	← Areas →				* Roof							
Col No	P.H. Landing @75*	P.H. Floor @75*	Main Roof @40*	Total Load	12-4 Floors		3d Floor		2d Floor		1st Floor	
					Area	@75*	Area	@75*	Area	@75*	Area	@125
1			140	5,6	140	10,5	140	10,5	140	10,5	42	5,3
2			188	7,5	174	13,1	174	13,1	174	13,1	176	22,0
3	68		180	12,3	164	12,3	164	12,3	164	12,3	192	24,0
4	91		100	10,8	99	7,4	99	7,4	R60* 99	9,8	184	23,0

Fig. 3

On the roof of this building, as in many similar cases, the areas were of 3 classes — a pent house landing, which came above the main roof; a pent house floor, at about the grade of the roof, and finally the roof itself, which includes both the main roof and the roof of the pent house. These are kept separate on account of the loadings per square foot which vary, one being 75 and the other 40 pounds, and also to make the calculations easy to follow afterwards. Each of these areas is multiplied by the proper load per square foot and the sum of the items placed in the vertical column marked "Total Load." The last 2 figures are considered as ciphers and are omitted to save space, and also to make the work more rapid and less liable to error. The various floors are figured in a similar way. On the 2nd floor of column 4 in the area column is an item marked R60. This represents an area of 60 square feet from a roof at this level in a light well or areaway. This is multiplied by 40 pounds per square foot, like the regular roof loads, and added to the area 99 multiplied by 75 pounds per square foot, giving 9, 8, that is 9,800 pounds.

Fig. 4 shows the final summary for column 2. The column number is shown in the first column, the floor in the second, and the live floor load in the third. Most building laws allow a reduction in the live load on columns where several floors are carried. By this is meant that the law takes into account that while some areas may be loaded up to the full live load designated by the law, it is unlikely that all areas or floors will be fully loaded at the same time. To take account of this when a column carries 1 floor, the full live load is used; when 2 floors are carried only a percentage is required to be used, in this case 75%, and when 3 floors are carried a still smaller portion of the full load is used, in this case 60%, and so on. As the building grows larger and more and more floors are added it becomes desirable to stop this reduction and use a minimum per cent; in this case for 6 or more floors 40% of the total live load is used. This method of reduction is apt to vary with different building laws and it is said that one of the objects of Mr. Hoover's present work is to promote a uniformity of the building laws throughout the country. The system used here is according to the Boston building laws. The live load for the roof is not allowed to be included in the live loads to be reduced and is, for convenience of tabulation, included in the column of dead floor loads as noted by the asterisk.

The fourth vertical column contains the per cent of live load used in each case and this multiplied by the partial summaries in the third column gives the reduced live load in the fifth column. The dead floor is figured on a sheet corresponding and similar to Fig. 3 and is transferred to the sixth column. The wall loads are transferred from the wall load summary (Fig. 2) to the seventh column and the column metal and covering (C. M. & C.) is entered in the eighth column of the tabulation. By column metal and covering is meant the weight of the steel column itself and the fireproof covering and plaster around it. In a 12-story building this will average about 2,000 pounds per story so that if this is used as in the present example we are on the safe side in the upper stories and about right in lower stories.

In figuring the wall loads we figured from center to center of columns. In so doing, at the corners of the building we omitted a small bit of wall at the extreme corner. This can be readily computed and added to the C. M. & C. of these corner columns. It usually about doubles the C. M. & C. for these columns.

The items in each column are added up at each floor, these totals being placed below the horizontal lines, and the totals, beginning with the reduced live load, are added up crosswise and entered in the ninth vertical column. An adding machine proves very convenient on these sheets to use after the entries have all been made and the live loads reduced. The tenth column shows the story for

which each total load in the ninth column applies. The eleventh column shows the unsupported length of each column in each story and is usually about 1 foot less than the story height. The twelfth and last column contains the section required, taken from the standard sheet of tables which we will now describe.

As we noted in the May FORUM, different building laws use different column formulae. The formula used in this table is that most commonly used, that is 16,000-70 l/r. The maximum stress per square inch in this table is 14,000 pounds per square inch and the maximum l/r is 120. Various cities which use this formula vary these two limits. Excepting for these variations in limits this formula is used by the American Railway Engineering Association and the cities of New York, Chicago, St. Louis, Detroit and Seattle.

This table shows the allowable load in thousands of pounds for lengths varying by 1 foot for differing sections varying in area by small amounts. In order that the different portions of the column may be of equal strength the thicknesses of metal in any one section are made nearly equal. While the thick webs are not economical this is considered good engineering practice and some specifications require it.

Many offices have very little system in keeping their calculations, and while there may be others which are quite as good as that described in this and the preceding article, the author feels that this system has great advantages over the practice common in many offices. For instance, the building from which this data was taken had 229 pages of calculations on paper 8¼ x 11. The sheets having the beam calculations had 3 or 4 beams per sheet. The calculations were made in 368 working hours which included 101 hours for the author, chiefly in supervision and consultation with the client. This also included the time of a stenographer in making a copy of all of the sheets. The floor was a concrete slab on steel beams and columns. Drafting was not included in this time. The work was done by 5 men besides the author and their stenographer. Neither the men nor the stenographer knew anything about the system and no one but the author worked any time excepting evenings, Saturday afternoons and Sundays. Not including the time on preliminary consultation with the client and the days at the last in making the copy of the calculations, the work extended over 11 days. This will serve to give an idea as to what should be expected from a system of this kind when the work is a rush job.

In addition to the direct loading of columns there is often an eccentric loading. This may be caused by a load being applied off the center of the column or by wind stresses. In any case this loading may be expressed by a bending moment. The resultant stress in the column is equal to the moment in inch-pounds divided by the sectional modulus of the column section. In this form it is awkward to design the column section as the method would not be direct, but by changing the arrangement of the formula we may obtain an expression from which we can get the required area by a direct method. This formula for the required area would be:

$$\frac{\frac{My}{r^2}+P}{f}=A$$

where M is the moment in inch-pounds, y the distance from the neutral axis to the most stressed point of the column section, r the radius of gyration of the column, P the direct load on the column, f the allowable fiber stress and A the required area of the section. When the type of column has been decided upon it is quite easy to get the value of $\frac{y}{r^2}$ near enough as it varies but little for different areas of the same type of column, and this can be

COLUMN LOAD SHEET

Col	Fl	Tot Live	%	Red Live	Dead Fl	Wall	CM&C	Total	St	L	Section
2	R				* 29,1	11,5	2,0	47,6	12	9	4-3"x3"x5/16" LS
	12	13,1			15,1	18,2	2,0				10"x5/16" pl
		13,1	100	13,1	44,2	29,7	4,0	91,0	11	9	
	11	13,1			15,1	18,2	2,0				4-4"x3"x5/16" LS
		26,2	75	19,6	59,3	47,9	6,0	132,8	10	9	10"x 3/8" pl
	10	13,1			15,1	18,2	2,0				
		39,3	60	23,6	74,4	66,1	8,0	172,1	9	9	
	9	13,1			15,1	18,2	2,0				4-5"x3½"x7/16" LS
		52,4	50	26,2	89,5	84,3	10,0	210,0	8	9	10"x 3/8" pl
	8	13,1			15,1	18,2	2,0				
		65,5	45	29,5	104,6	102,5	12,0	248,6	7	9	
	7	13,1			15,1	18,2	2,0				4-5"x3½"x5/16" LS
		78,6	40	31,4	119,7	120,7	14,0	285,8	6	9	10"x 3/8" pl
	6	13,1			15,1	18,2	2,0				2-12"x 3/8" pls
		91,7	40	36,6	134,8	138,9	16,0	326,3	5	9	
	5	13,1			15,1	18,2	2,0				4-5"x3½"x7/16 LS
		104,8	40	41,8	149,9	157,1	18,0	366,8	4	9	10"x7/16" pl
	4	13,1			15,1	18,2	20				2-12"x7/16" pls
		117,9	40	47,0	165,0	175,3	20,0	407,3	3	9	
	3	13,1			15,1	17,8	2,0				4-5"x3½"x½" LS
		131,0	40	52,3	180,1	193,1	22,0	447,5	2	10	10"x9/16" pl
	2	13,1			15,1	18,8	2,0				2-12"x9/16" pls
		144,1	40	57,6	195,2	211,9	24,0	488,7	1	16	
	1	22,0			19,4		2,0				4-5"x3½"x11/16" LS
		166,1	40	66,4	214,6	211,9	26,0	518,9	B	9	10"x11/16" pl
											2-12"x11/16" pls

* Includes both Live and Dead Loads

Fig. 4

multiplied by the moment in inch-pounds and added to the direct load, giving the numerator of the fraction which is the equivalent direct loading. In some cases it is desirable to use a higher allowable stress for eccentric loading than for direct loading alone. It might be proper to use 16,000 pounds per square inch the same as for the extreme fiber stress in beams. If this were so, we can divide this equivalent direct load by the higher allowable stress, and also divide the direct loading by the usual allowable stress and use the greatest result for the required area. When the designer does not consider it prudent to use a greater allowable stress he may look up the required section directly in the design table (Fig. 5) already used in this article, using the equivalent direct load.

In computing eccentric loads it should be noted that they are not cumulative, one story below another as a rule, as the beams framing into the column at the two floors can form a resisting couple sufficient to take care of the eccentricity above. It should also be noted that even what may appear to be an eccentric load at one floor may be amply resisted by a beam framing into the column at that floor. This moment of resistance is usually equal to the value of the rivets in the top or bottom angles multiplied by the depth of the beam, or in the case of a web connection, to the resistance in tension of the heads of the rivets. As has been already noted, the author prefers a column connection for a beam consisting of a seat and top angle to a web connection, one of the reasons being here apparent that the value of the rivets in shear is more reliable than tension on the heads. Of course the resistance of the angles to bending has to be taken into account as well as the value of the rivets.

Columns for tall buildings are usually made in 2-story lengths, planed at each end. The upper end of each column is placed about 1½ feet above the floor line to allow splice plates to be placed on the flanges of the column below. These extend about 1½ feet above the top of the column, with open holes to be riveted in the field to the column above. For medium sized columns these plates can be made ⅜ inch thick and about 3 feet long, each containing about 8 shop and 8 field rivets. Some designers add a plate on each side of the web with 3 or 4 shop rivets and the same number of field rivets. While this adds to the rigidity of the splice, the author would not consider it necessary unless it were in columns having web plates of great size.

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PLATE & ANGLE COLUMNS 16000 − 70 $\frac{2}{r}$ Max $\frac{2}{r}$ = 120

SECTION			LENGTH IN FEET																										
4 L's	10"x	2 12"x	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
3"x3"	5/16	5/16	141	134	126	119	111	103	96	88	81																		
4"x3"	5/16	5/16		159	153	147	141	135	129	124	118	112	106	100	94	88													
		3/8		167	160	154	148	142	135	129	123	117	110	104	98	91													
5"x3½"	5/16	5/16			185	181	176	171	167	162	157	153	148	143	139	134	129	124	120	115									
	3/8					208	202	195	189	183	177	171	165	159	152	146	140	134	128	122	116								
		3/8			223	217	210	204	197	191	185	178	172	165	159	152	146	140	133	127	120								
	7/16					243	236	229	222	215	208	201	194	187	180	173	166	159	153	146	139								
		7/16				252	244	237	230	222	215	208	200	193	186	178	171	164	156	149	142								
	1/2					276	268	261	253	245	238	230	222	214	207	199	191	184	176	168	161								
	5/16	5/16	5/16				286	279	272	266	259	252	246	239	233	226	219	213	206	200	193	186	180	173	167	160			
		3/8					294	287	280	273	266	259	252	245	238	231	225	218	211	204	197	190	183	176	169	162			
			3/8				318	310	303	296	288	281	274	266	259	252	245	237	230	223	215	208	201	193	186	179			
	3/8						344	336	328	320	312	304	296	288	280	273	265	257	249	241	233	225	217	210	202	194			
		7/16					350	341	333	325	317	309	301	293	285	277	269	261	252	244	236	228	220	212	204	196			
			7/16				372	363	355	346	338	329	321	312	304	295	287	279	270	262	253	245	236	228	219	211			
	7/16						400	390	381	372	363	354	345	335	326	317	308	299	290	281	271	262	253	244	235	226			
		1/2					405	395	386	377	367	358	349	339	330	321	311	302	293	283	274	265	255	246	237	227			
			1/2				429	419	409	400	390	380	371	361	351	342	332	322	313	303	293	284	274	264	255	245	236		
	1/2						455	444	434	424	414	403	393	383	373	362	352	342	332	321	311	301	291	280	270	260	250		
		9/16					464	453	442	432	421	410	400	389	378	368	357	347	336	325	315	304	293	283	272	262			
			9/16				484	473	462	451	440	429	418	407	396	385	375	364	353	342	331	320	309	298	287	276	266		
	9/16						510	498	487	475	464	452	441	429	418	406	395	383	372	360	349	337	326	314	303	291	280		
		5/8					519	507	495	483	472	460	448	437	425	413	402	390	378	367	355	343	332	320	308	297	285		
			5/8				540	528	516	504	492	480	468	456	444	432	420	408	396	384	372	360	348	336	324	312	301		
	5/8						564	551	539	526	514	501	489	476	464	451	439	426	414	401	389	376	364	351	339	326	314		
		11/16					572	559	546	534	521	509	496	483	471	458	446	433	420	408	395	383	370	357	345	332	320		
			11/16				594	580	567	554	541	528	514	501	488	475	462	449	435	422	409	396	383	369	356	343	330		
	11/16						619	605	591	577	564	550	536	523	509	495	482	468	454	440	427	413	399	386	372	358	345		
		3/4					628	614	600	586	572	558	544	530	516	502	489	475	461	447	433	419	405	391	377	363	350		

Fig. 5

Modern Floor Coverings

PART II

By E. H. HOWARD

IN considering the question of floor coverings it is well to realize fully the tremendous advance made in linoleum and cork carpeting. Some of the English manufacturers, prior to the war, made an inlaid linoleum which was an exceedingly good counterpart of terrazzo. The gloss in the marble chips appeared to advantage, as well as the duller color of the cement. This material was particularly satisfactory where large areas could be covered without the need of any paneling, but there are many instances where this linoleum was used with a panel and border composition which was very effective.

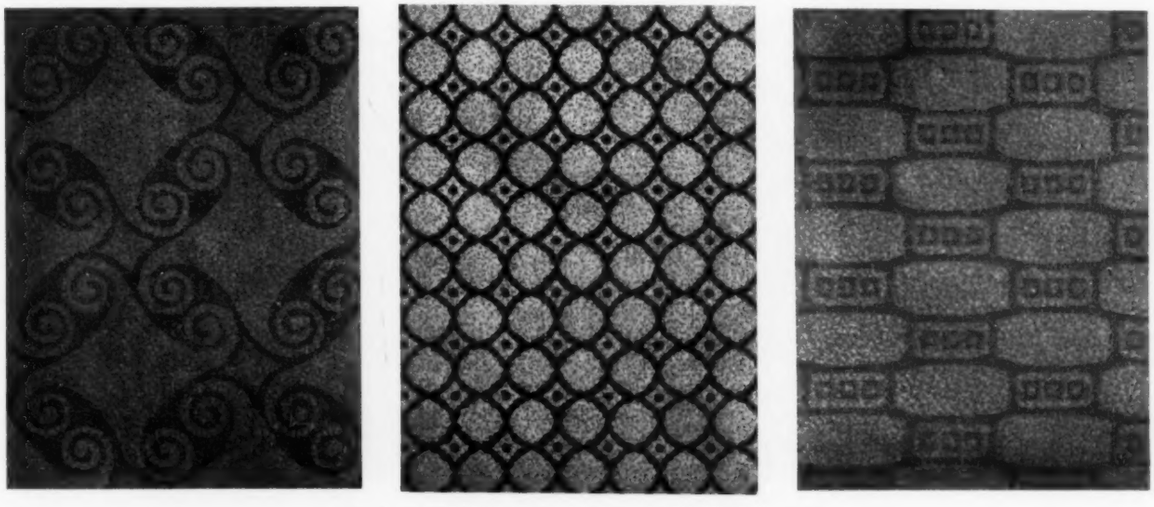
Many times in office buildings and places where the floors receive hard usage, it has developed that the linoleum has had excessive wear in some particular place, for example, before a door. If the linoleum in such a place is a plain color the only method of repair is either to patch the linoleum or to take up a full width and lay a new piece. This necessitates the waste of considerable good material and sometimes it is difficult to get the shade necessary to match the adjoining work. However, if the architect selects a pattern linoleum, it can easily be repaired, if worn, without any great expense.

Another interesting fact regarding linoleum is the statement made by an eminent biologist that it is "bacteria proof"; in fact he maintains that the presence of linseed oil in the linoleum has a distinct tendency towards disinfecting the room in which it is laid. Tests have been made which show that germs cannot live or propagate on linoleum. As a floor covering for hospitals it is exceedingly useful.

There are infinite variety and possibilities in the use of linoleum, and so it is with cork carpeting, which, as has been previously noted, has a much softer surface and texture than linoleum, and it is often used in work of a character different from that to which linoleum is adapted. Cork carpeting, for example, can be used with a large field and with a narrow border around it, such as one frequently finds in two-tone rugs. This gives a pleasing appearance and also satisfactory service.

No consideration of floor covering would be complete without a consideration of cork tile. This is of the same general composition as the "cork carpet" excepting that cork shavings are used and are formed into tiles under high pressure. As a result, the density of the tile is even greater than that of linoleum and still there is no appreciable loss of resilience. This material, in addition to being available in almost any color, shape, size or design, can be used in a wide variety of patterns, making it a material of considerable merit. The tile is impervious to almost any substance except grease, and is readily cleaned. As a floor covering its use is not limited to any certain character of work, but is adapted to almost any situation where a clean, sanitary, noiseless floor is desired. The illustration on the next page shows an effective installation of contrasting colors.

Linoleum and cork carpet have both been frequently used as covering for stair treads and are found very satisfactory for this purpose. Neither material offers a slippery surface under any conditions, and with a metal nosing or a safety tread at the edges the linoleum is protected from wear at its weakest point. Under certain conditions these same materials may be used for the risers as well as for the treads, sometimes improving the appearance.



An Indication of the Range of Patterns Available in Linoleum

Cork Tile Floor in a Boston Tea Room
Blackall, Clapp & Whittemore, Architects

Cork tile seems to be better adapted to special forms of construction than the other carpetings. It may be moulded into special shapes, such as sanitary bases, and in stair construction may form a cove between tread and riser. With this material also a nosing must be used in order to protect the edges from damage. Cork tile requires a slightly different floor preparation from the carpeting. If placed on concrete the surface should be smooth-troweled. If placed on wood there should be a reasonably smooth surface and over this a layer of waterproof paper or felt. It is essential that cork tile be laid under such conditions that it will not be exposed to dampness from below.

As yet nothing has been said relative to rubber tile and similar materials. Rubber tile was originally an interlocking tile type, in which each piece was laid individually on the floor. Now this same composition is put together in sheet form, and can be arranged with border and field as desired. Sometimes burlap is used to hold the material together so it will not be damaged in either transit or laying. It also forms a key between the composition and the floor to which it adheres. Rubber tile has an almost limitless range of color, composition and pattern; it is practically noiseless on the floors and is a soft but durable and almost waterproof medium.

Another type of floor covering is the synthetic rubber, in which a variety of colors may be had. For example, a very good representation of Siena marble, black and gold and gray with a black vein, may be obtained. This is true also with terra cotta, white and black. In appearance this material departs radically from other floor coverings on account of its mottlings, grainings and colorings. There is a large variety of plain colors as well as the variegated surfaces. The coloring is carried throughout the entire thickness of the material, so that in event of wear the coloring is not destroyed. The characteristics of this type of floor covering are similar in every respect to those of rubber. It is soft and comfortable to walk upon and is noiseless and like a rubber surface it is hard enough to be impervious to liquids and stains.

In all the types of floor coverings that have been mentioned so far, the maintenance costs are negligible. Damp mopping or wiping up the floor is quite sufficient to restore it to a clean appearance and scrubbing is seldom necessary. Linoleum and carpeting are sometimes stained or painted, but this is not necessary with the rubber or synthetic flooring

In discussing composition flooring one must always have in mind that some floors have a close similarity to concrete. Still, this analogy is rather remote because the surface is not so hard but still is dustproof and durable and is made of various materials. One of the basic compounds is magnesite, which adds the characteristic of an inert material. It is not susceptible to swelling or shrinking and when once in place is always in place as long as the under material remains unmovable. This material is put down in a plastic mass and can be carried up on the walls to form a dado, base, panels or any pattern.

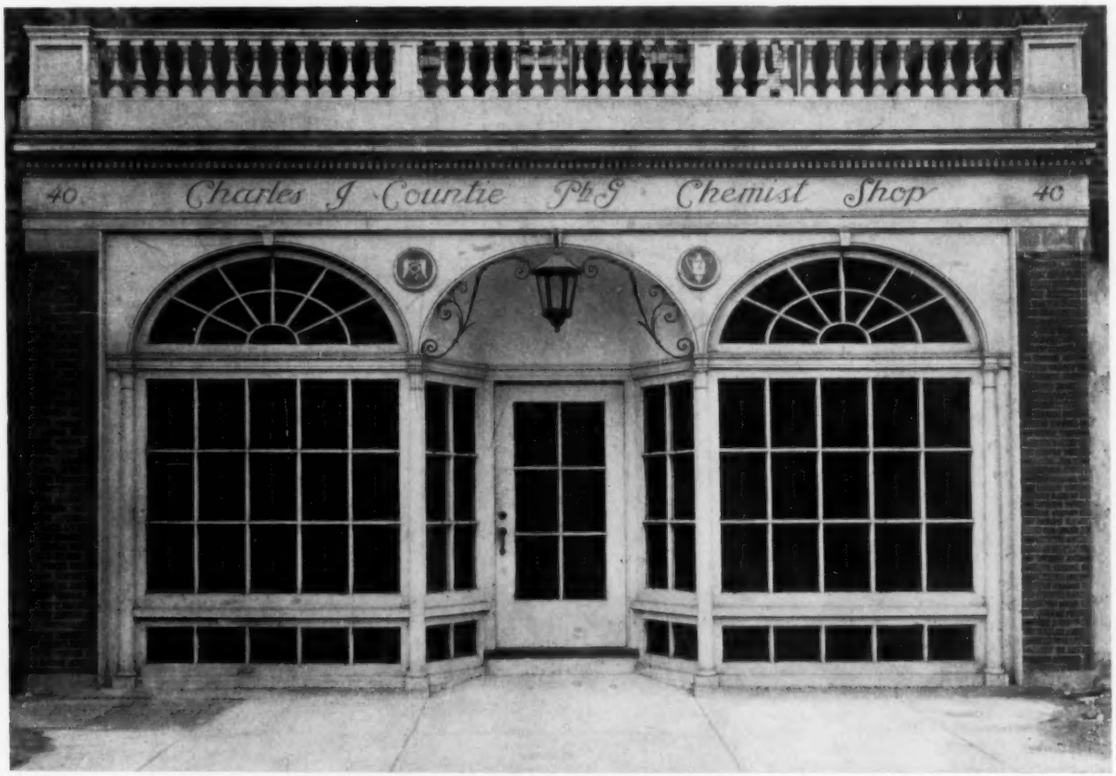
In preparing the under floor for this sort of work it must be borne in mind that it can be laid on concrete or wood or practically on any surface with the assurance that it will properly adhere. When it is laid on wood a fine mesh wire on expanded metal is tacked down to act as a binder to hold the material together and to the floor. With concrete this is not necessary. In preparing a floor for linoleum or for cork carpeting where concrete is the basis to which the material is to be applied, the concrete should not have a smooth-troweled finish. The floor should be reasonably level and smooth, but if the concrete is a little rough it forms a better key for adhesion. However, when the composition is applied to a wood floor, the floor should be smooth, as otherwise the roughness is likely to show through the linoleum and the wear will be the greatest in the uneven places. With so great a variety of floor coverings available the architect will be able to make a selection which will satisfy every requirement of service and add an appearance of dignity.

MINOR ARCHITECTURE
EXEMPLIFIED IN MODERATE COST BUILDINGS

Small Store and Apartment Groups

FOR various reasons the architectural improvement which is so marked in the designing of the small house, the usual apartment building or the average business structure, does not seem to have been extended to the designing of small store buildings or those structures containing stores and living apartments which are often built in suburban sections or in certain residence quarters in cities. Such commissions are seldom of a size sufficient to make them attractive to architects or to render them the subject of great effort, and in most instances the amounts which the owners are willing to expend are such that only the barest fundamentals may be had; there is rarely opportunity for the expenditure of more than the amount necessary for securing the minimum of building for which there may be obtained the maximum of return.

In many instances such structures do much to either make or mar their surroundings, and it often happens that the architect into whose office is brought what may at first seem to be a rather forlorn hope is able to point out to the prospective owner certain possibilities which lie within reach and thus there is brought about an enlargement of the project which may result in its being something more



Chemist's Shop for Coombs Real Estate Trust, Boston, Mass.
Dana Somes, Architect

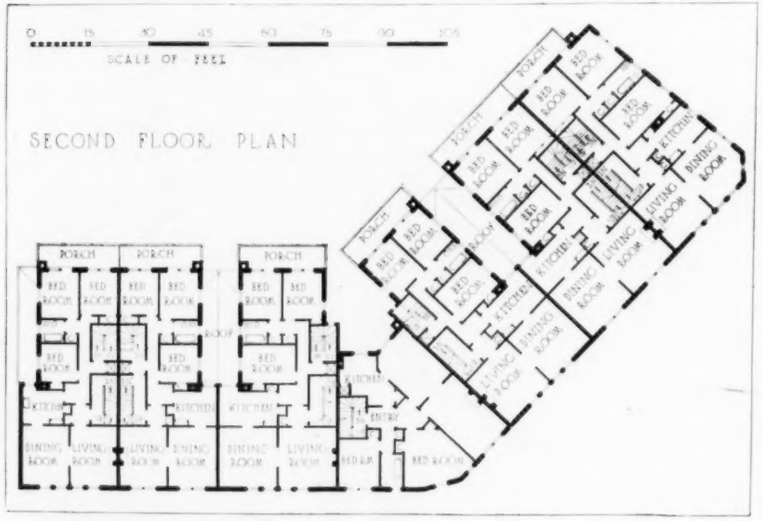
than a dreary combination of utility and ugliness. In almost every village there is a demand for living quarters which may occupy one or two upper floors, or else such floors may be utilized for offices, thus increasing the possible revenue to a point which would warrant the building of a structure vastly different from that which the owner originally had in mind.

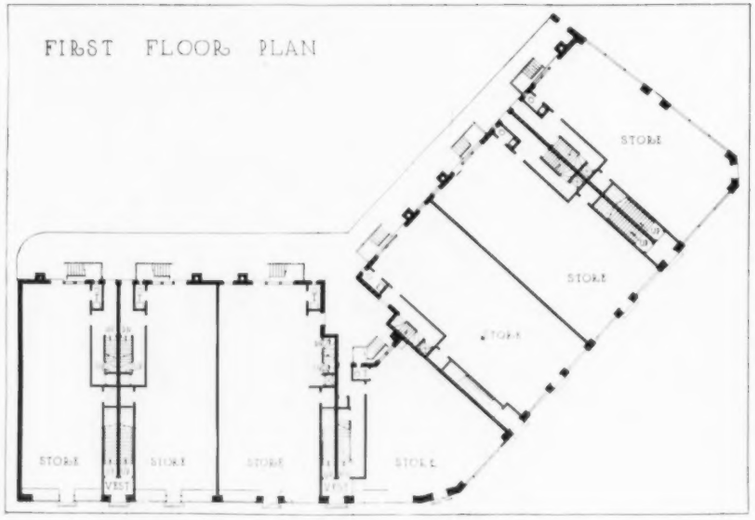
Much depends upon the encouragement which the architect holds out and upon the degree of interest which he feels in the undertaking, and consequently in the attention which he gives to the design. That the design counts for much is proved in the case of the small shop building illustrated upon page 65. The structure is but one story in height because of the extremely small depth of the property and the necessity of affording light to the rear windows of apartments built just back of the store and fronting another street. In this instance the owner, with as much enthusiasm and interest as the architect, tried to embody in this modest facade something of the architectural feeling of Beacon Hill, in Boston, at the foot of which it is located, and the financial value of a distinctive exterior was evident in the number of applications for rental long before the building was completed.

The three-story structure illustrated upon this page is on a corner in a New York suburb and the very prominence of its location necessitated a suitably dignified architectural treatment. The lower floor, as will be seen from the plans, is divided into a number of stores which accommodate most of the business activities of the village, while the two floors above contain 14 apartments of six rooms and bath. Each tier of apartments has its own front and service entrances and dumb waiter and the different tiers are separated by brick fire walls.

The business and residence structures shown in two other illustrations suggest other variations in the broad range of possibilities which such buildings present and prove anew that these buildings need not necessarily assume the stereotyped appearance which is usually given them. One of the buildings is a detail in a village which has grown up about a large manufacturing plant and is one of a group of structures, designed and planned with more than ordinary care, which serve to house the firm's operatives. Much of the interest of this building lies in the use of the colors—dull blue and burnt orange —which are used for exterior trim and upon the sign board before the "community shops." The other example of the store and residence group illustrates a method of treatment which would be suitable almost anywhere and the plan, which shows well arranged stores and studio apartments with baths and kitchenettes above, may suggest a form for a village development which would be advantageous from an economic standpoint besides forming a decidedly valuable architectural asset to any community in which it might be placed.

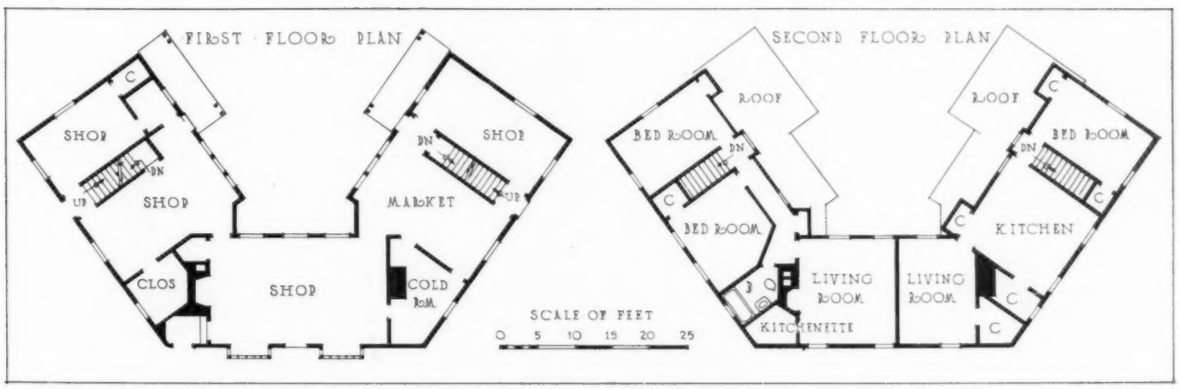
Village Stores, Great Neck, Long Island, N. Y.
James W. O'Connor, Architect





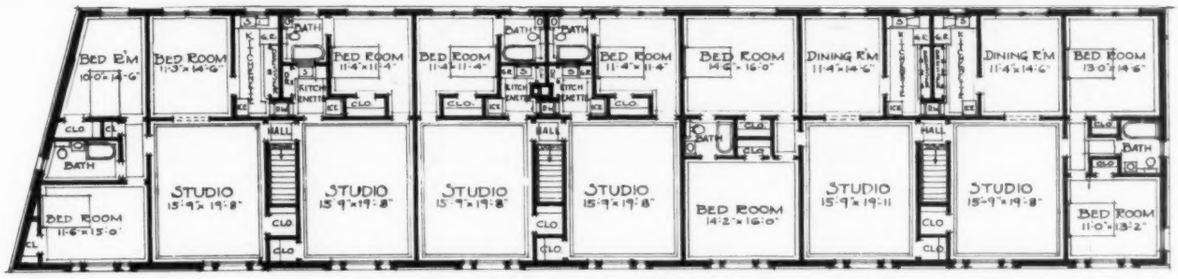
VILLAGE STORES, GREAT NECK, LONG ISLAND, N. Y.

JAMES W. O'CONNOR, ARCHITECT

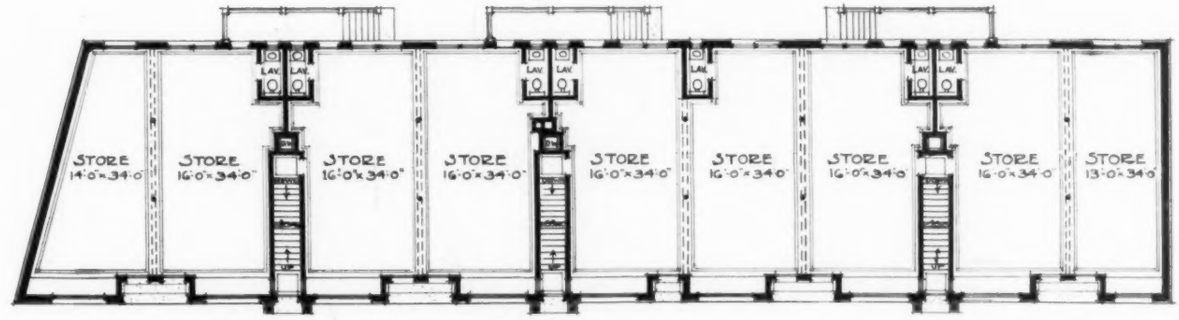


COMMUNITY SHOPS, DANIELSON, CONN.

WILLIAM H. COX, ARCHITECT

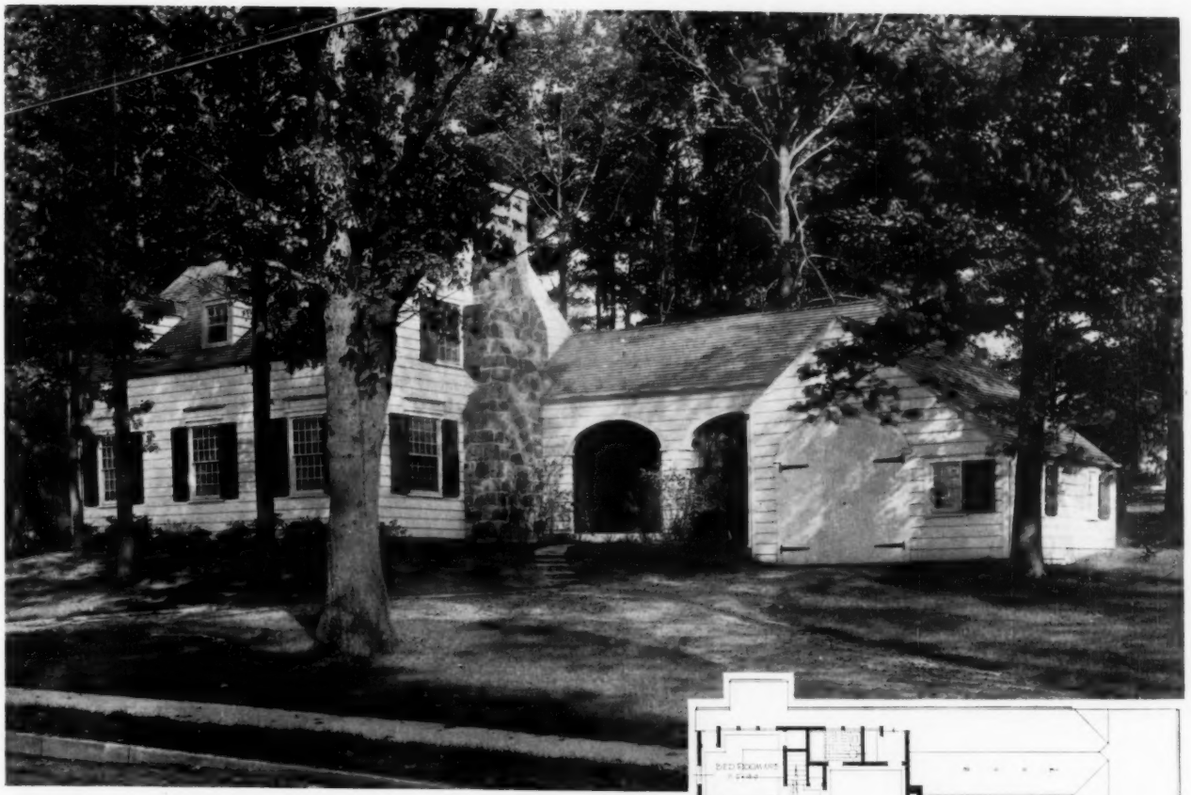


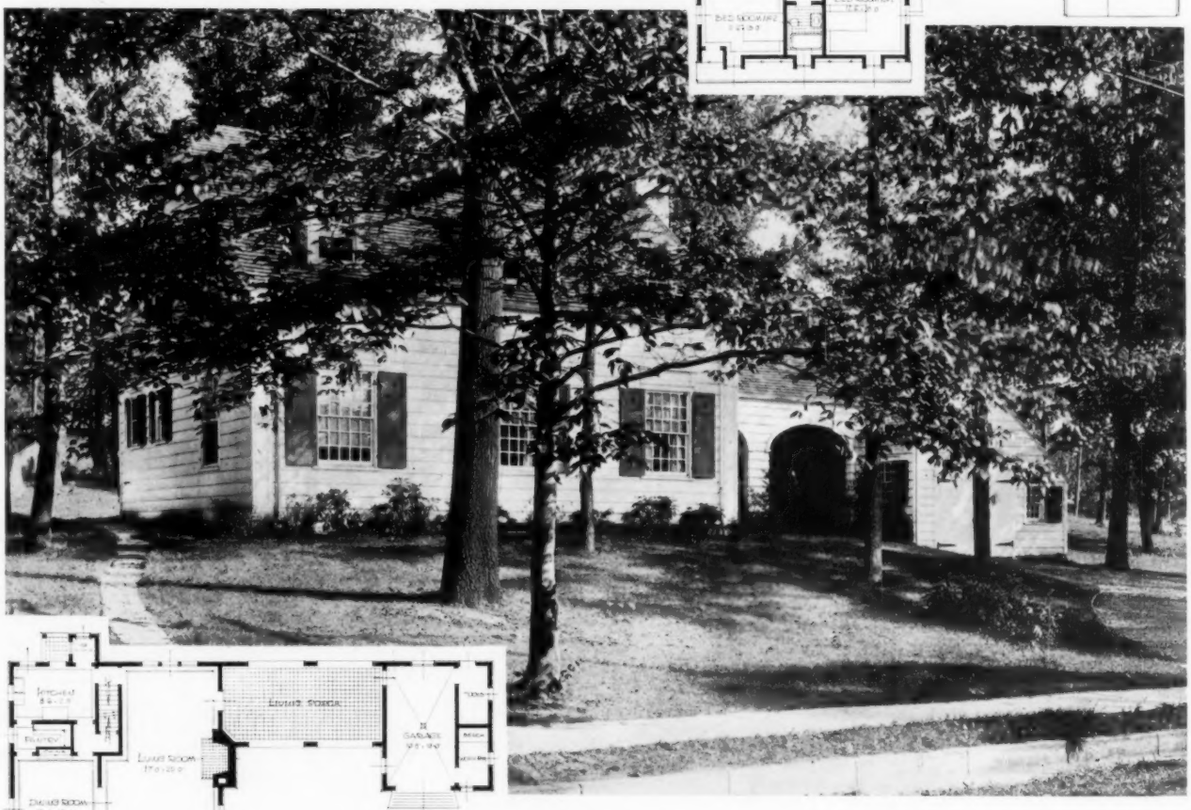
SECOND FLOOR PLAN



STORES AND STUDIOS, BRONXVILLE, N. Y.

BATES & HOW, ARCHITECTS





HOUSE OF ROBERT MEARS, ESQ., TENAFLY, N. J.

R. C. HUNTER & BRO., ARCHITECTS

Details of Early Southern Architecture

INTERIORS OF SHIRLEY, JAMES RIVER, VIRGINIA

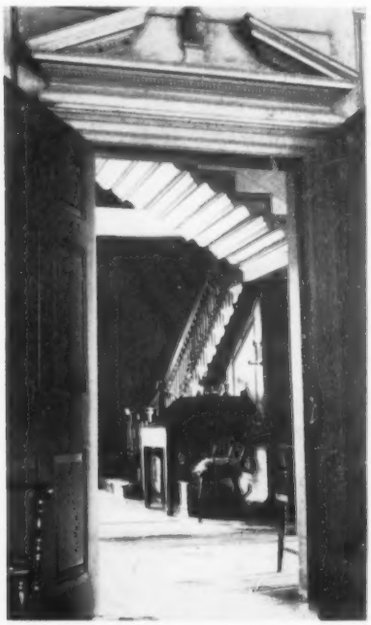
MEASURED DRAWINGS BY GODDARD M. WHITE

THE woodwork of old colonial houses in the south, and particularly the interior trim, is often surprisingly luxurious and of a somewhat heavier and bolder scale than similar woodwork of the corresponding period farther north, where a colder climate necessitated smaller rooms, involving a treatment generally simpler and more restrained. Sometimes, it is true, the southern woodwork exhibits the shortcomings which are apt to accompany the excellent qualities it possesses—an exaggerated scale, or an excess of lavishness of design—but in the main the trim of old houses in Maryland or Virginia affords an excellent basis of study.

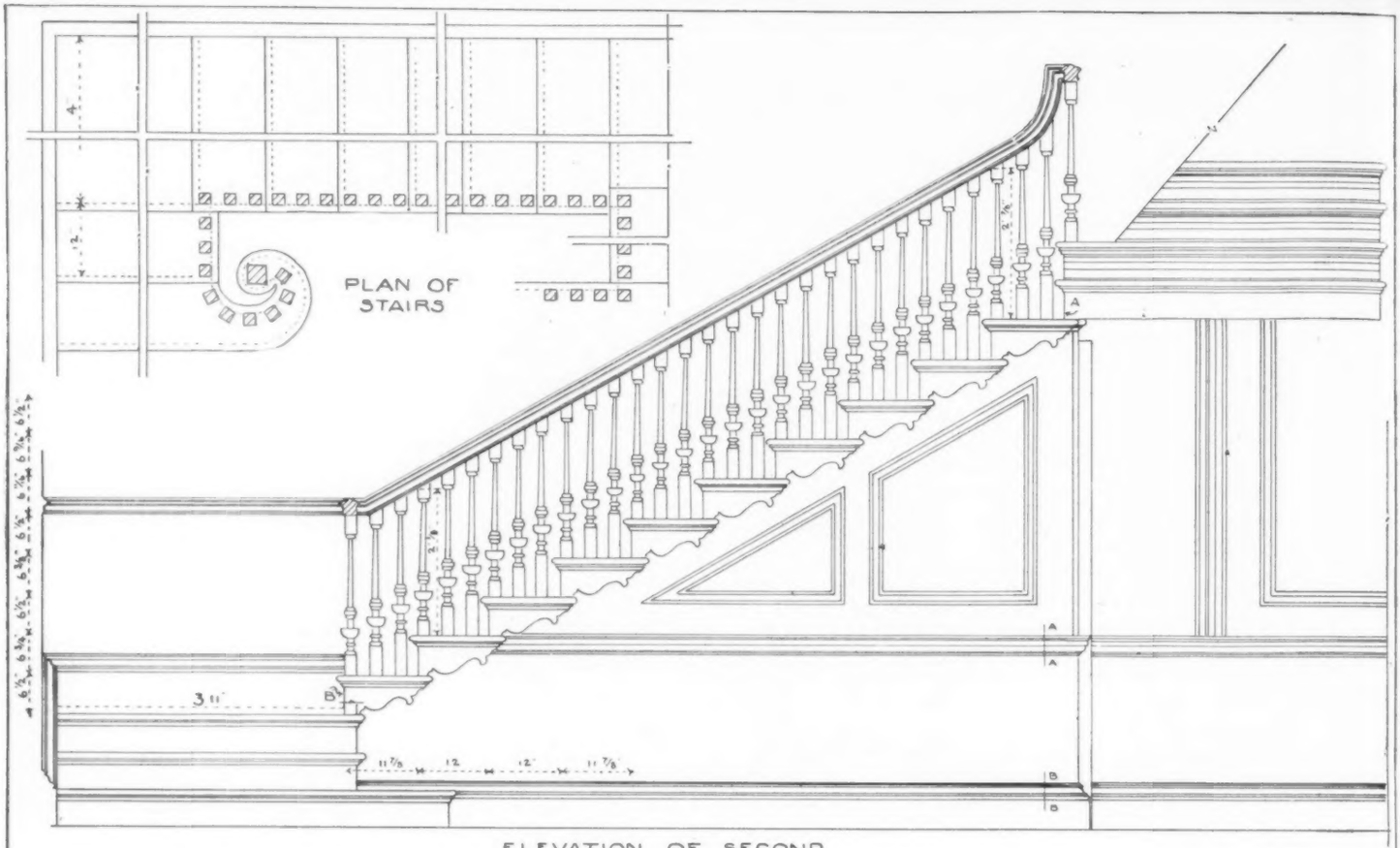
Drawing Room Doorway

Shirley, one of the most famous of the Virginia plantation houses, presents a plan which is unusual in that instead of possessing the customary hall at the center, the hall is placed at one corner of the building and made of considerable size to accommodate the important stairway which is the most striking detail of the building. While the trim of all the most important rooms is comparatively rich and sumptuous, the stairway claims the chief attention of the student, owing partly to the unusual construction of the upper run which is entirely apart from the wall, as may be seen from one of these illustrations, and partly to the interest of its design and the excellence of its proportions. A stairway of the colonial type much over 4 feet wide is not pleasing because the handrail, to appear in proportion, must be impractically high. The eminent English architect, Peter Nicholson (1765-1844), records the fact that a handrail should be 33 inches above the center of the step. The stairs at Shirley are 4 feet wide and the rail is a fraction over 31 inches high, not far from Nicholson's specification and giving excellent proportions. The depth of the tread is 12 inches and height of risers 6½ inches.

Almost as interesting as the stairway is the drawing room door, of correct proportions, without which the colonial atmosphere is not present.

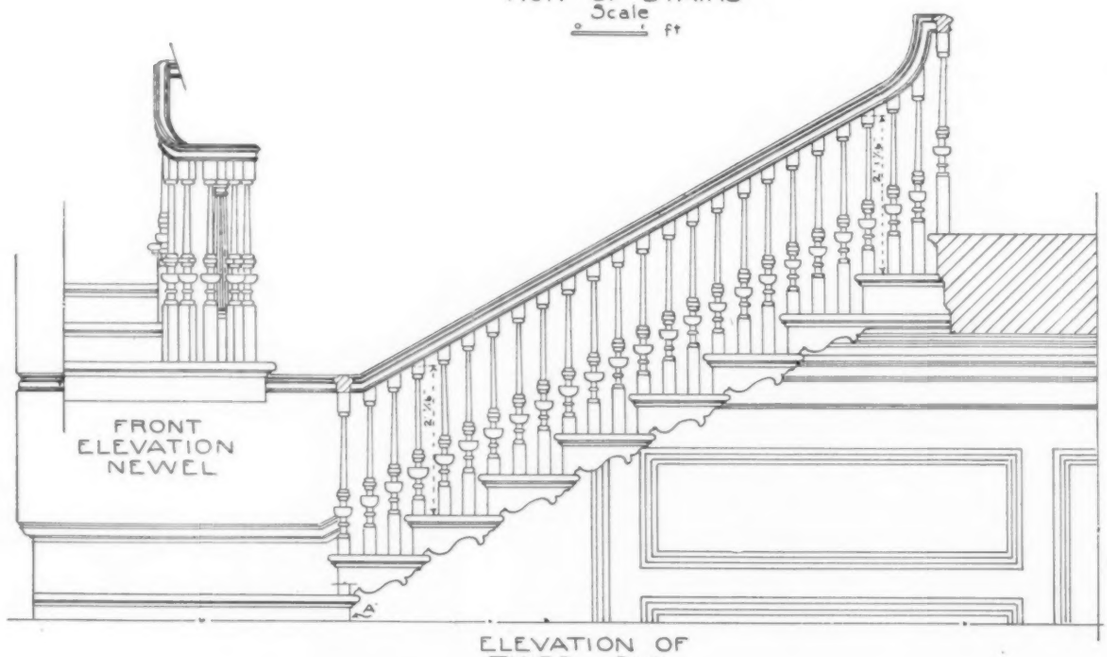


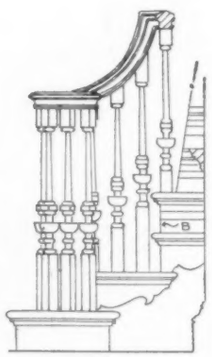
Details of Stairway and Door at Shirley



ELEVATION OF SECOND RUN OF STAIRS

Scale 0 1 ft

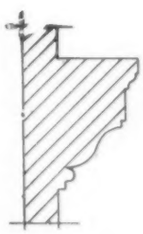




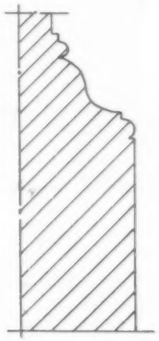
SIDE ELEVATION

Note
Line A A and
same also.
B B.

ELEVATION OF THIRD RUN



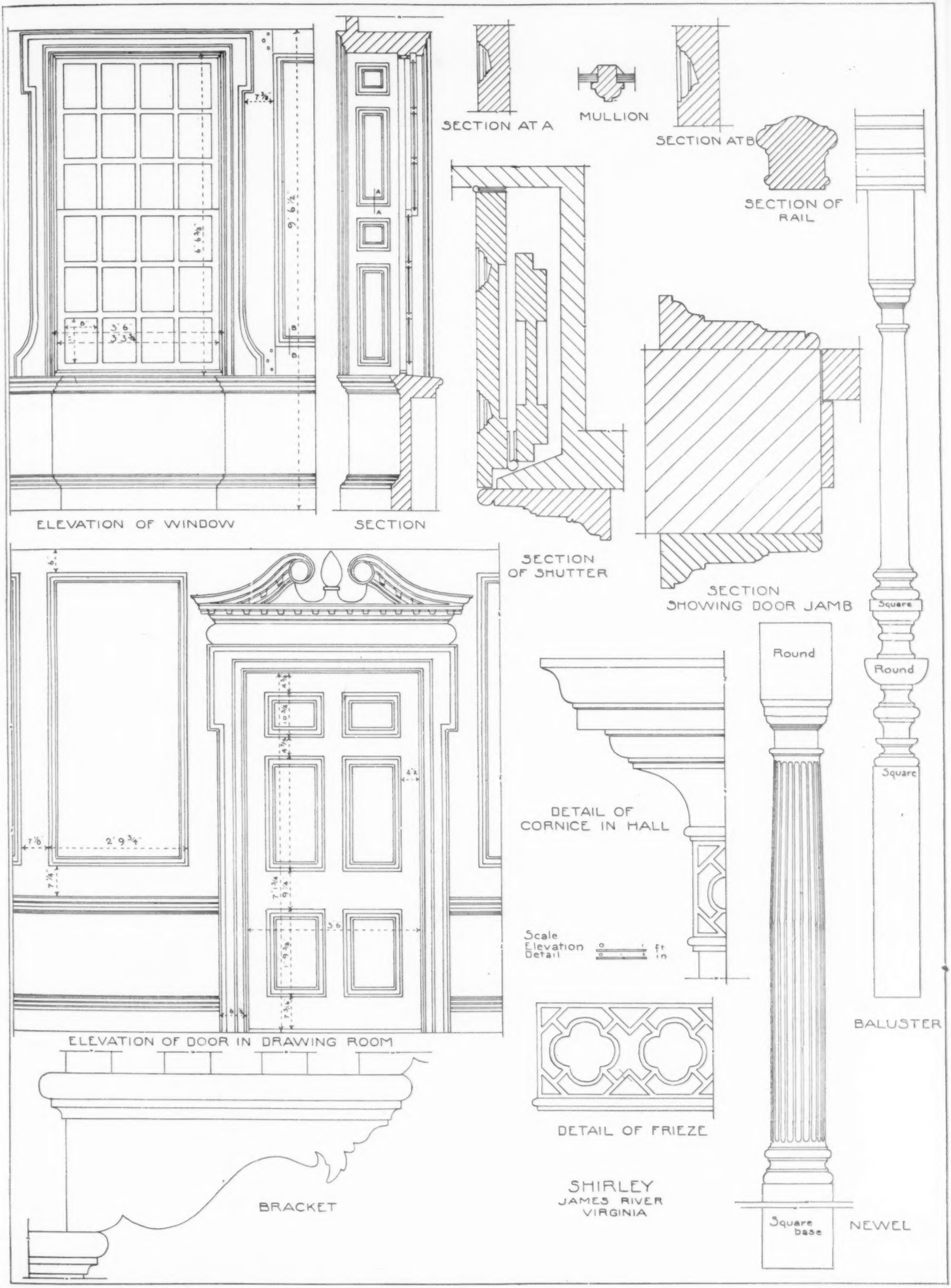
SECTION AT A

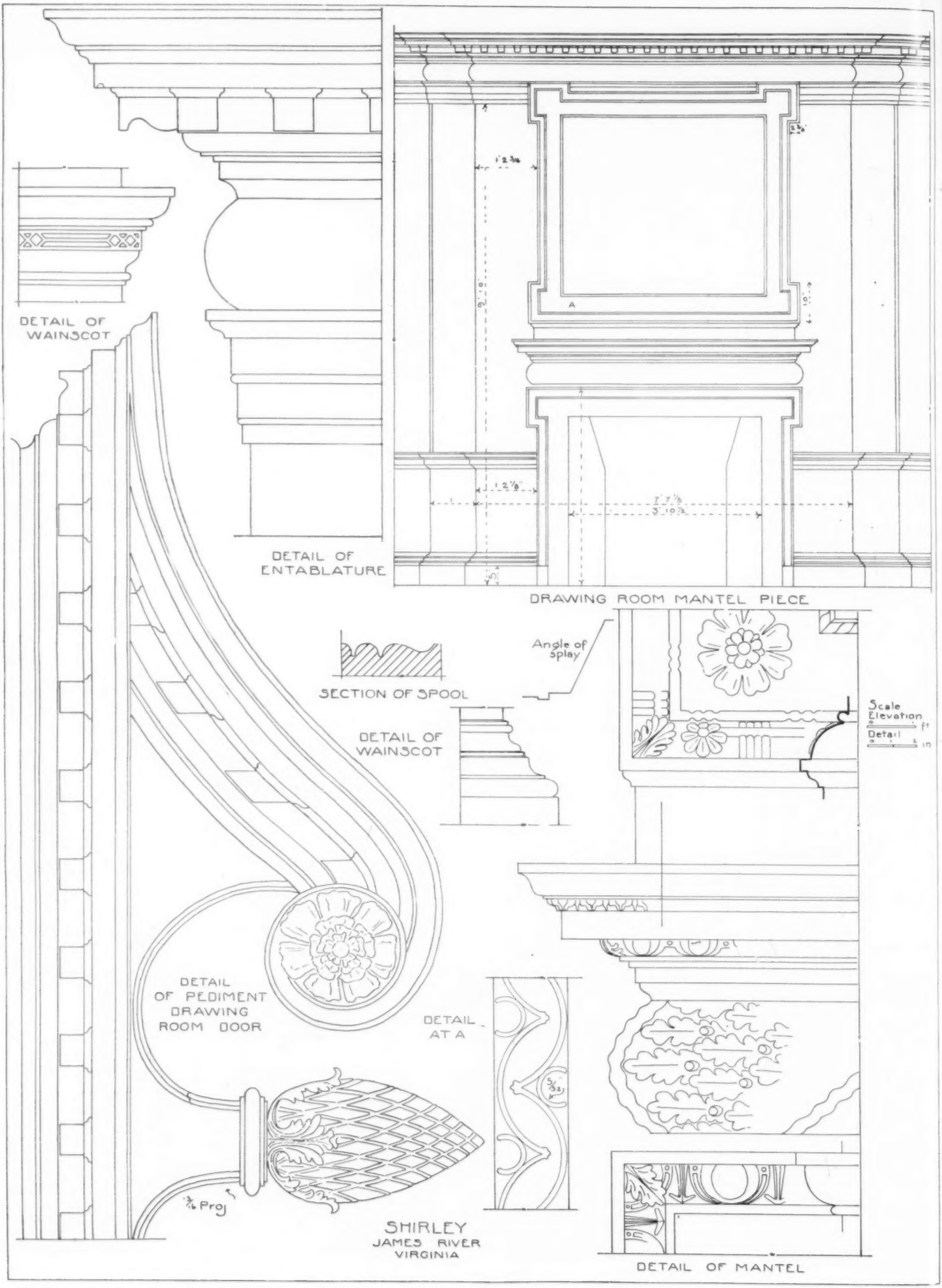


SECTION AT B

Scale 0 1 3 in

SHIRLEY
JAMES RIVER
VIRGINIA


SECTION AT A
MULLION
SECTION AT B
SECTION OF RAIL
ELEVATION OF WINDOW
SECTION
SECTION OF SHUTTER
SECTION SHOWING DOOR JAMB
Square
Round
Round
Square
DETAIL OF CORNICE IN HALL
Scale Elevation Detail
ft
in
BALUSTER
ELEVATION OF DOOR IN DRAWING ROOM
DETAIL OF FRIEZE
BRACKET
SHIRLEY
JAMES RIVER
VIRGINIA
Square base
NEWEL


DETAIL OF WAINSCOT
DETAIL OF ENTABLATURE
DRAWING ROOM MANTEL PIECE
SECTION OF SPOOL
Angle of splay
DETAIL OF WAINSCOT
Scale Elevation
Detail
DETAIL OF PEDIMENT DRAWING ROOM DOOR
DETAIL AT A
SHIRLEY
JAMES RIVER
VIRGINIA
DETAIL OF MANTEL

BUSINESS & FINANCE

C. Stanley Taylor, *Associate Editor*

Quantity Surveying; a Definite Element in Architectural Practice

IN the Service Section of the June issue of THE ARCHITECTURAL FORUM announcement was made of recommendations regarding the use of quantity surveys made by a joint committee consisting of members of The American Institute of Architects, The Associated General Contractors of America and The Engineering Council. Details from a preliminary draft of the report of this committee were given. Briefly, the use of a quantity survey in connection with a building project was highly recommended. It is quite apparent, therefore, that this action will serve to increase the interest in quantity surveying, which has been growing rapidly in this country during the past few years.

Such a survey, in itself, is merely an accurate record of quantities, carefully taken from the plans and specifications on which the contract is to be let. In some instances, where the architect's organization includes men capable of doing this work, a quantity survey may be prepared in the architect's office. As a rule, however, the services of organizations which specialize in quantity surveying are engaged, and payment is made at a cost varying from one-fourth of 1 per cent to 1 per cent of the total estimated cost of the project.

From the report made by the joint committee, already referred to, one section may be quoted:

"The cost to owners of preparing bids by existing methods, which make necessary wasteful duplication in estimating quantities by several bidders, is known to be much greater than the cost of preparing bids based on a quantity survey furnished by the owner, and therefore such existing methods are condemned and should be discontinued."

This leads to consideration of the various ways in which the quantity survey may be used by an architect:

1. The survey may be issued to bidders under a general contract and used by them as a check on their own estimates. In this way the architect protects the owner and deals fairly with contractors who are placed in a position to bid without introducing the element of cost where each must take off his own quantities, or the element of risk resulting from an error in figuring quantities — an item for which some allowance is usually made in the contractor's figures. Evidently under this system a closer bid may be obtained.
2. The survey may be kept in the architect's office and used for the purpose of checking up quantities with bidders who may be receiving consideration, before the contract is finally signed.
3. The survey may be made an actual part of the contract in which the contractor bids definitely on the basis of quantities given in the survey.
4. The survey may be made the required uniform basis for all bidders, specifying that the successful bidder will be given opportunity to verify the survey, and that if he proves errors in the survey may revise his bid correspondingly before signing a contract, or within a limited period of time. This method insures that all bidders are figuring on the same basis and makes it possible for them to submit figures more quickly if desired and at less overhead cost since they are not called upon to figure actual quantities on the job until the contract has been awarded.

It is quite evident that usually, when awarding a contract, reliance is placed on comparison of bids taken and of past performances by those contractors who may be under favorable consideration. In many instances these bids do not reflect the true requirements of the work, as various safety elements have been introduced. In many cases, also, bids are made under a loose system of figuring which is largely guesswork on the part of the contractor. In these days when it is so important to be certain of the cost and to develop the lowest possible cost figures compatible with the requirements of the work, the quantity survey offers a method of eliminating waste due to errors in estimating and duplication of effort.

Undoubtedly the average general contractor who has not given careful study to this question of using the quantity survey will be inclined to condemn it. Many contractors in the past have shown that they prefer to gamble on quantities or to trust to a favorable interpretation of plans rather than reduce these elements to a sound, businesslike basis of fact, assuming definite obligations based on definite requirements. Further consideration of the matter, however, seems to have convinced many contractors that operating under a quantity survey is a desirable condition. In this way competition for a contract is made much more businesslike as the foolishly low bidder is eliminated as well as the "safety first" bidder.

who puts in a figure far too high. This leaves an open field for the contractor who seriously wants the contract and is willing to estimate fairly and carefully in order to get it.

The quantity survey has other elements of value from the architect's viewpoint. It can easily be understood that with a quantity survey the preliminary estimates will not be based on excessive quantities. In many instances figures received from contractors have been based on much higher estimates of quantities than have been necessary, in turn affecting the total estimated costs to such an extent that owners have been unwilling to go ahead with the projects. If the figures had been developed correctly, on the basis of the quantity survey, such overestimating of cost would have been eliminated and sound figures presented, which would have proved acceptable from the owners' viewpoint. Again, the quantity survey is of distinct value in checking up the architect's plans and specifications. It constitutes a practical test and service to eliminate any errors in plan or specification. The quantity survey is of particular value where an architect is operating under a separate contract method, as it serves to eliminate all guesswork in the various trades or group of trades to which may be given the separate contracts and separate quantity surveys. This naturally means no overlapping of contracts and no omissions. The architect who has his work laid out in this manner and is possessed of definite quantity figures for his separate contracts is usually in a far better position to execute a building project than the average general contractor whose bid has been based partially on guesswork.

We are told by one quantity surveying organization that on some contracts they have called to the attention of the architects over 100 items that were not definitely covered or which were palpably in error. Instances of this sort have included discrepancies between plan notes and ¾-inch detail, such as a 4-inch slab noted on plan but shown as 5 inches on section. Drawings have been submitted showing walls without foundations. Indefiniteness as to the extent of work of different kinds has raised such questions as where granite stops and limestone begins, the line between marble and tile, and other similar details. In many instances work is specified under several trades which might easily result in several payments being made for the same work. In one case which came to our attention copper louvres were specified under carpentry, sheet metal and miscellaneous items. Again, it was found that a contractor figuring on a plastering contract gave figures from 10 to 15 per cent too high, due to loose averaging methods of estimating. Framing lumber bills have been found as much as 10 per cent too high. On one intricate cut stone contract the architect had been told by prospective contractors that there were 30,000 cubic feet of stone. A carefully prepared survey, however, developed the fact that the work required only a little over 20,000 cubic feet — an excess of 50 per cent.

At a time when it is necessary to get a quick bid on a building project many an architect has found the quantity survey of value, as it served to check up with the bidders rapidly in order to close the contract. In one instance, after the figures in such a survey were turned over to the bidders they in turn went over their quantities and reduced their bids substantially, saving several times the cost of the survey. Another interesting instance was in connection with a large interior trim contract. What looked like a foolishly low bid on this item was investigated and accepted, the architect realizing that the figures of the quantity survey had been made known to the bidder. Ordinarily no assurances on the part of the bidder would have made the architect feel safe in accepting such a figure. He probably would have discarded the bid without considering it, when as a matter of fact, owing to having special stocks of material on hand, the bidder was able to submit an unusually reasonable figure.

These are times when an architect must employ every legitimate means to be certain of the accuracy of estimate and contract figures. In many cases the accurate knowledge developed by the quantity survey may serve as a means to insure the immediate carrying out of a project which otherwise might be postponed. The quantity survey is also a form of insurance which may serve to greatly decrease the chances of receiving bids which are too low for the contractor to carry out successfully. Experience has shown that even though the contractor may be financially able to stand a loss resulting from mistakes in his quantity estimates, he does not do so cheerfully and the consequent delay and dissatisfaction have their direct effect upon the owner's opinion of the services of the architect, even though he is not directly to blame.

In other recent articles in this section of THE ARCHITECTURAL FORUM we have from time to time pointed out the advisability of securing a large number of sub-contract figures in order that a greater range of selection of contractors may be available; through this medium it is possible to obtain lower figures than in the case where a limited number of sub-contractors are asked to bid on a contract. This may be greatly expedited by the quantity survey, as ordinarily in many instances sub-contractors will put in bids largely on guesswork, adding a large percentage as a factor of safety. This is often because the sub-contractor is unable or unwilling to figure quantities with care. Naturally, if the quantities are provided for him he is in a position to make a quick and safe estimate which he will be inclined to do under these circumstances. This elimination of the vague "safety" factor in bidding is particularly to be desired.

If information is desired on specific points relative to this subject of quantity surveying the Service Department of THE ARCHITECTURAL FORUM will be glad to supply the required data.

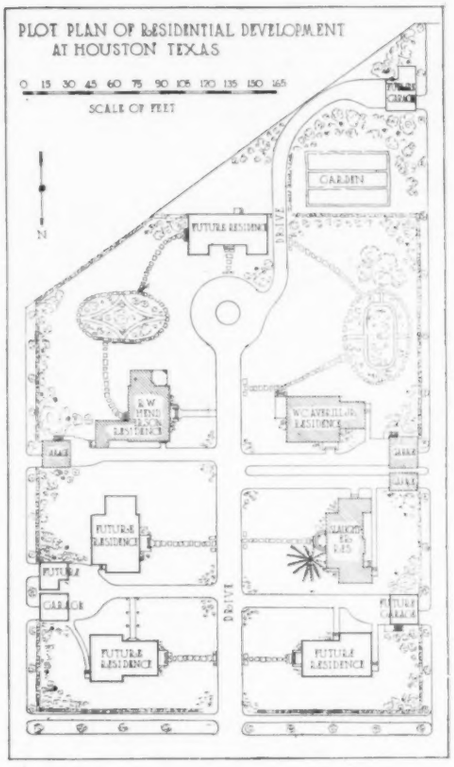
A Texas Residential Development

J. W. NORTHROP, JR., ARCHITECT

THE residence project which is here described brings out in an interesting manner the point that sometimes there may be co-operation between prospective home builders without developing the property upon what is ordinarily known as a co-operative basis.

Early in 1920, J. W. Northrop, Jr., an architect, of Houston, Texas, suggested to a group of his clients, who wished to build homes at about the same time, that they unite in purchasing an entire city block, approximately 250 x 240. This block was selected by the architect and laid out in accordance with the plan which is illustrated here. The plot of land was divided to accommodate seven dwellings, grouped around a private driveway and developed in such a manner as to form a modern residential unit. It was found that owing to a great increase in automobile traffic the city streets adjoining this property were objectionable because of the noise and dust. For this reason the houses are arranged to back upon the city thoroughfares, and garages and servants' quarters face these streets which are used only for service and deliveries, but owing to the designing of the buildings and the careful placing of the garages this has not resulted in detriment to surrounding property. The method of laying out this space is interesting and attractive. The first result of co-operation on the part of the future home owners was found in the possibility thus provided of taking a large tract of land and arranging it more attractively and conveniently for those who planned their homes here.

The details of arrangement and financing are of interest. There were four clients who were interested in building upon this property. No company was formed to purchase the land, but each of the four furnished one-fourth of the cost of the equity in order to acquire the entire block. The land was then plotted into seven building sites, as shown upon the plot plan. Four of these were selected by the new owners, leaving three sites to be sold ultimately to others who might wish to join the colony. Three individuals who wished to build their homes immediately then paid off their proportions of the blanket mortgage on the land in order to clear their own lots, leaving only a first mortgage on the sites not to be built upon at once. Under the Texas homestead laws it is difficult to obtain building loans, as they are known in the north, and for this reason there was no definite financial problem as the three owners arranged to invest sufficient money to pay for the houses as they developed.



The project of building these three houses was placed entirely in the hands of the architect. Under his supervision separate contracts were let for the

View from Entrance Showing Grouping of Houses

First and Second Floor Plans

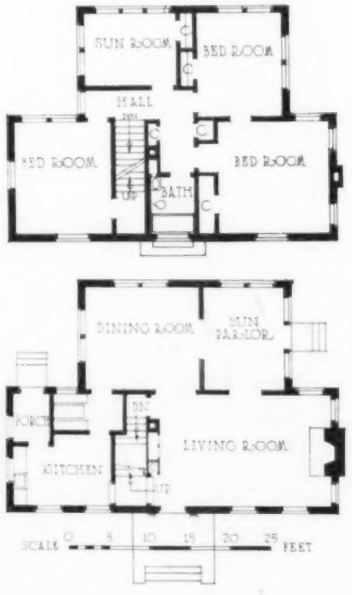
House of Dr. J. W. Slaughter, Houston, Texas

development of the land, including grading, curbs and gutters, and the necessary extension of sewer and water lines to the building sites. A central concrete drive and driveway returns were laid and brick and stone piers were erected at the entrance to the block. The cost of these improvements was divided pro rata among the seven building sites into which the original block was divided. Separate plans and specifications were made for each of the three houses erected, and competitive bids were taken on each so that a separate contract was let to the lowest reliable bidder for each house.

It was found that the method as thus outlined gave each owner complete freedom in developing his own residential property. There were placed necessary restrictions on the building sites which served to secure for each a maximum supply of light and air and lawn space and which guaranteed to the group of home owners a further growth quite different from that of the average speculative development in which buildings are placed too closely together or designed so that there is no unity of mass. It is interesting to note, from the financial viewpoint, that after the block improvements were made and all costs had been charged against each building site, it was found that the cost (approximately 40 cents per cubic foot) was about one-fifth less than the asking price of similar improved adjoining property. It would seem that the business details of this transaction were handled in an excellent man-

House of P. B. Miller, Esq., Houston, Texas

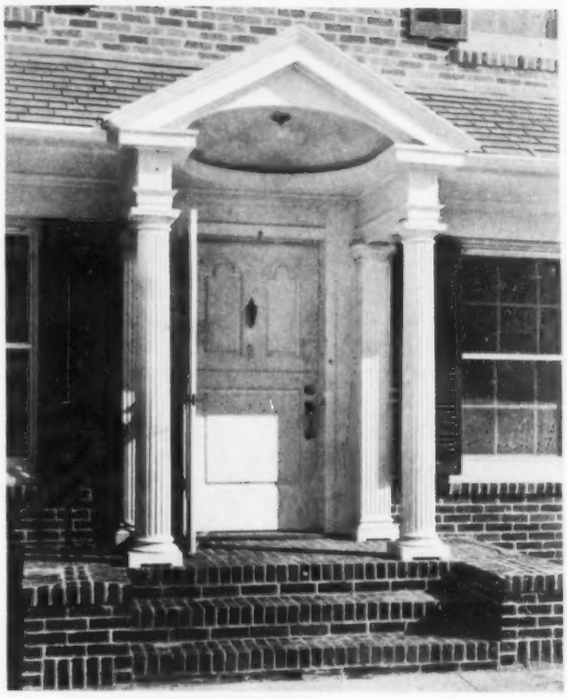
J. W. Northrop, Jr., Architect



First and Second Floor Plans

ner by the architect, who conceived the plan, selected the land, and finally sold the idea to a group of prospective clients. Undoubtedly there has been a considerable saving upon all the details of this operation and the cost to the original owners will be reduced by the selling of the plots not already built upon.

Architecturally these dwellings indicate definitely the increasing interest in colonial design in residential construction and its constantly widening influence. The value of simple lines, studied mass effects and arrangement of exterior openings is always definite where such designs are carefully developed by the architect. In this instance the architect's problem was complicated by climatic conditions—in fact this operation probably represents one of very few successful attempts to adapt early American architecture to the peculiar climatic conditions of this section of the country, where a room not exposed to the prevailing southeast breeze is of little practical use in summer. It was necessary, therefore, to employ larger and more numerous exterior openings than would be necessary in buildings in the north and east. Careful provision also must be made to secure cross drafts. There were details of planning employed by the architect to solve exposure and air circulation problems, as will be noted in the floor diagrams, such as the provision of smaller or ell-shaped wings, together with careful orientation. For the exteriors of these houses a local rough surfaced face brick was employed, using shades of red and gray laid with light gray mortar, the joints being flush with the face of the brick. For one of the houses a deep red face brick of very rough texture laid in white mortar was used. Roofs are of green slate or of cedar shingles stained a soft gray-green. Three-coat plaster on metal lath was used for the inner walls throughout; rough sand finish was employed and a final coat was tinted by using a small amount of mineral pigment which provided finishes in gray and tan without the use of paint. A complete electrical installation in each of the three houses includes electrical heating, water heating system and electrical kitchen range. Another house under construction has an interior finish with canvas and paper on shiplap. The roof is of green slate shingles, and gas is used for range and automatic water heater. A hot water heating system is provided in this house. The costs of these houses averaged from 46 to 52 cents per cubic foot, varying according to specifications.



Detail of Entrance to Henderson House

First and Second Floor Plans

House of W. C. Averill, Jr., Houston, Texas

J. W. Northrop, Jr., Architect

EDITORIAL COMMENT

WHAT OF THE INDIVIDUAL ARCHITECT?

ONE of the outstanding developments in the economic progress of the past few years is the movement toward co-operative effort. This has already attained such proportions in the business world that it has changed entirely some of the basic principles of business. Whole groups of producers, distributors and even retail dealers are associated for greater economic advantage; information of various kinds is freely exchanged among the members, on the theory that the ultimate benefit to the groups and to the individuals comprising them will result in putting the smaller elements in possession of the experience and knowledge of the larger and more powerful. Business has prospered under these new conditions, and it would naturally follow that associated effort is largely responsible. That there are dangers in such a course is obvious. Investigations in the field of building material supply alone have uncovered the ease with which the power offered by such combinations can be applied to selfish advantage through the elimination of competition, curtailment of production and other means designed to increase profits.

The architectural profession is not without a share in this modern tendency, and since several instances in various sections of the country have appeared it may be worth while to analyze their possible effect on the practice of architecture and the promotion of the art. The most recent activity of this nature to come to our attention is the Allied Architects' Association of Los Angeles. This Association was organized in the first week of July, 1921, with the purpose of providing the municipal, county, state and national governments with the group services of a number of architects in the designing of public buildings. It is the theory of this Association that its members can submerge their individual interests and collectively offer the civil authorities an opportunity of securing the highest quality of architecture in public buildings and at no greater cost than would be incurred in the employment of an individual architect. The Association is prepared to design and execute work of a public nature and will maintain the necessary offices and organization, entirely apart from the offices of its members and from their practice as individuals.

Upon an examination of the plan, from such reports as have reached us, it seems only fair to say that while the excellent intentions of the proponents of the idea are entirely praiseworthy, it is difficult to see in its operation—even under the most favorable conditions—any reasonable basis for hope for either a higher development of architecture or better service to the various forms of civil government to which the services of the Association are offered. Architecture is one of the most individualistic of the arts and it is hard to understand how it could be successfully carried on by following the "merger" methods which might be entirely successful in many forms of commercial effort. One could name scarcely a single example of highly successful architecture which is not the visible, tangible expression of the genius and daring of some individual architect, or which could have assumed its present form if worked out under a plan which would divide the responsibility among 30 or more. It would be quite as reasonable to expect a masterpiece of painting or sculpture from an effort in which a score or more artists were called into co-operation, each to have a voice in the determination of the result; the outcome would probably be a compromise, which would not represent the ideas or personality of a single individual.

There are other reasons why the plan, as we understand it, seems to be an unwise venture; among them might be mentioned its effect upon architects as a body—excepting those belonging to the Association—and upon the public at large. Discouraging indeed to the rank and file of the architectural profession must be a gathering into an exclusive body of many of the leading architects of any locality, which might well attract to itself any national, state or municipal commissions available, to the total exclusion of architects outside the body. There has been considerable expression among architects of a desire to claim a position in the community which would be a logical and fitting expression of the importance of the profession. This position, we feel, is amply deserved and if seriously and confidently claimed it will be readily conceded, but we doubt very much if the profession's claims, in the eye of the public, will be greatly strengthened by any such association of effort as is here put forth. The general public has formed its idea of what architecture stands for and this opinion will only be weakened and confused by any unwise move which would render vague or obscure its functions as generally understood.

Not that we undervalue or deprecate any form of practical co-operation. We are convinced more and more that this is the time when co-operation in every worthy form should be encouraged, employed and emphasized; nevertheless, we feel that there are some departments of effort, such as architecture, in which co-operation in unusual forms is hardly practicable, and among these forms, we fear, must be classed the effort which has been considered here.

FIREPLACE IN THE DAVANZATI PALACE, FLORENCE